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AN ANNOTATED BIBLIOGRAPHY OF METEOROLOGICAL TOWER AND MAST STUDIES

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Subject
Bibliography
Wind

BIBLIOGRAPHY OF SPECIAL STUDIES

1962

WB/BS-1 Automotive Air Conditioning

1966

WB/BS-2 Cloud Information and Data for Mainland China

WB/BS-3 A Selective Bibliography in Climatology and Meteorology

WB/BS-4 Guide to the Availability of Climatological Information for Australia

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WB/BS-5 An Annotated Bibliography of Meteorological Tower and Mast Studies

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An Annotated Bibliography of Meteorological Tower and Mast Studies
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INTRODUCTION

This bibliography consists of sources containing meteorological data and/or information obtained from towers and mast. Primary interest is on wind data.

All available sources in the U. S. Department of Commerce, Atmospheric Sciences Library, Environmental Sciences Services Administration, were examined and abstracted.

Many of the sources were obtained from either "Meteorological Abstracts and Bibliography" (M.A.B.) or "Meteorological and Geoastrophysical Abstracts" (M.G.A.). The foregoing are published by the American Meteorological Society (Malcolm Rigby, Editor). Also a number of the abstracts are the author's or authors'. Credit has been given by following the abstracts with M.A.B., M.G.A. and Author's abstract respectively.

AN ANNOTATED BIBLIOGRAPHY OF METEOROLOGICAL TOWER AND MAST STUDIES

Prior to 1900

1. Marriott, William Results of thermometrical observations made at 4 feet, 170 feet and 260 feet above the ground at Boston, Lincolnshire, 1882-1886. Royal Meteorological Society, Quarterly Journal, 13(64): 272-279, October 1887. 4 tables. DWB M(05) R888q V.13.

   ...Observations were made at several points on the Boston Church Tower, Lincolnshire, which rises to the height of 273 feet in very flat country, quite free from any obstructions. To avoid climbing the tower each hour, the telethermoscope was used and comparative readings made at hourly, bi-hourly or thrice-daily intervals. These data are compiled to show the diurnal and seasonal changes in lapse rate.--JAW

1900-1909

2. Akerblom, Filip Recherches sur les courants les plus bas de L'atmosphere au-dessus de Paris. (Research on the air current near the ground in Paris.) Societas Scientiarum Upsaliensis, Nova Acta, Ser. VI, 2(2), 1908. 45pp. 14 eqs., refs., 28 tables. DWB M/1331 A638.

   ...A study based on records made by ANGOT at various levels on the Eiffel Tower and on the ground for 6 years (1890-1895), in which the author considers the effect of stability (lapse rate in temperature) on variation of wind from the gradient (as determined from synoptic charts), and also diurnal and seasonal variations. The theory is worked out, assuming simple horizonal motion, and the coefficients of viscosity from summer and winter are given.--JAW

1910-1919

3. Hellman, Gustav Über die Bewegung der Luft in den untersten Schichten der Atmosphäre. (On the movements of the air in the lowest layers of the atmosphere.) Meteorologische Zeitschrift, 34(8-9):273-285, August-September, 1917. eqs., fig., 5 tables DWB M(05) M589z V.34.

   ...Variations in wind speed and wind profile under varying thermal lapse rate conditions and locations (Nauen and Potsdam) are shown by comparison of anemometer readings at various heights (2,16,32,123 and 258 m above the ground) for different times of the day and seasons. Difference between diurnal variations of wind on days or months with strong and with light winds are also shown. The conditions at higher levels are reversed (stronger at night above, during the day below).--JAW

4. Taylor, Geoffrey Ingram Phenomena connected with turbulence in the atmosphere. Royal Society of London, Proceedings, Ser. A, 94(658):137-155,1918. 7 figs., refs., 4 tables. DWB P Collection.

...Using five years of temperature observations made on the Eiffel Tower in Paris at 18, 123, 197 and 302 m above the ground, the author computes values of K. He found K to be of the order of $10X10^4$, but varying with seasons and height above ground--much greater than over the sea ($3X10^2$), but of the same order as from pilot balloon observations at Salisbury Plain ($5X10^4$). HELLMAN'S observations at Potsdam at 2, 16 and 32 m are compared and found to agree essentially.--JAW

1920-1929

5. Brunt, David Internal friction in the atmosphere. Royal Meteorological Society, Quarterly Journal, 46(194):175-185, 1920. 24 eqs., fig., refs. DWB M(05) R888q V.46.

...Theoretical conditions is given to the frictional forces which cause a loss of momentum and a consequent veering of the wind with height, and an attempt is made to rationalize the results of numerous observations made at Paris, Lindenberg and other places in Europe, America and on the Atlantic Ocean, with this theory or vice-versa. It was concluded the K must vary with height. Discussion by WHIPPLE, DINES and GIBLETT, and reply by the author are appended.--JAW

6. Chapman, Sydney On the changes of temperature in the lower atmosphere by eddy conduction and otherwise. Royal Meteorological Society, Quarterly Journal, 51:101-116, 1925. eqs., 4 tables. DWB M(o5) R888q V.51.

...A further discussion of temperature observations on the Eiffel Tower analyzed by G. I. Taylor, W. Schmidt and J. Durward. From differentials of potential temperature with height and time, estimates of conductive and radiative factors of variation are obtained.--JAW

7. Johnson, Sir Nelson K. A study of the vertical gradient of temperature in the atmosphere near the ground. Great Britain. Meteorological Office, Geophysical Memoirs, No. 46, 1929. 32pp. eqs., 21 figs., 12 tables. DWB M(055) G786g V.5, No.46.

...An early investigation of vertical temperature gradients near the ground (near the village of Porton, on the southeastern edge of Salisbury Plain) including a description of the platinum resistance thermometers used and continuous records of air temperature at a height of 1.2 meters, differences in temperature over the intervals of height 1.2 to 7.1 meters and 1.2 to 17.1 meters. Detailed consideration is given to diurnal variation of gradient and change of this variation throughout the year. Included are the following data based on the period 1923-1925; monthly

Source No. 7 continued

means of hourly values of temperature at height of 1.2 meters; monthly mean values of the temperature difference over the two height intervals 1.2 to 7.1 meters and 1.2 to 17.1 meters; monthly mean values of the temperature difference over the two height intervals for clear and overcast days and nights for June and December; and monthly means of hourly values of temperature at a height of 1.2 meters for clear and overcast days and nights for June and December.--JAW

8. Richardson, Lewis F. Turbulence and vertical temperature difference near trees. Philosophical Magazine, London, 49:81-90, January 1925. 4 figs., refs. DWB P Collection.

...Effect of wind direction (from trees to measuring point) and the necessary conditions for "just no turbulence" are worked out theoretically and empirically and show some agreement with previous studies made by the author. Temperature differences between junctions 4.4 and 18.3 m above the ground were carefully measured in vicinity of trees, and wind speed and direction measured with a Dines anemometer at 26 m and 2 m. Gustiness at 26 m is plotted as a function of temperature difference of the layer below that level, showing low gustiness with stable (cold) air and high gustiness with steep lapse rate.--M.A.B. 4B-38

1930-1939

9. Barkat, Ali Variation of wind with height. Royal Meteorological Society, Quarterly Journal, 58(245):285-288, July 1932. 2 figs., table. DWB M(05) R888q V.58.

...From observations at 1.7 and 21.7 m at Agra, the diurnal variations of $\phi=\log(V_2/V_3)/\log(h_2h_3)$ is plotted for three seasons and compared with lapse rate of temperature. Observations at 21.7 m are also compared with 200 m and $(\phi-0.46)/\mu$ found to be nearly constant (μ coefficient of eddy viscosity).--M.A.B. 4B-68

10. Flower, W. D. An investigation into the variation of the lapse rate of temperature in the atmosphere near the ground at Ismailia, Egypt. Great Britain. Meteorological Office, Geophysical Memoirs, 8(71), M.O. 409b, 1937. 87pp. eqs., 40 figs., 13 plates, 28 refs., 27 tables. DWB M(055) G786g V.8, No.71.

...Arrangements for determination of lapse rate variations in the lowest 61 meters of the atmosphere at Ismailia, Egypt are described, together with an account of the analysis of autographic records obtained during the period 1931-1932. Continuous records were kept; diurnal and annual variations are described. Relation between vertical gradient of wind velocity, wind velocity and lapse rate is treated. Growth and decay of nocturnal inversions is considered in detail.--JAW

11. Fritzche, Gerhard and Stange, Rudolf Vertikaler Temperaturverlauf uber einer Grosstadt. (Vertical temperature lapse rate over a large city.) Beitrage zur Physik der freien Atmosphare, 23:95-110, 1936. eqs., 15 figs., 5 refs., table. DWB M(05) B422 V.23.

...The coefficient of austausch is calculated by Ertel's method. Continuous air temperature records at 80, 50, 35, 25 and 4 m above the ground at Leipzig were utilized.--JAW

12. Giblett, M. A. and others The structure of wind over level country: Report on experiments carried out at the Royal Airship Works, Cardington. Great Britain. Meteorological Office, Geophysical Memoirs, 6(54), 1932. 119pp. 93 figs., 28 tables, appends. DWB M(055) G786g V.6, No.54.

...An investigation presenting masses of data and reproduction of numerous records as well as analysis of data and theoretical developments. Anemographs were fitted with drums that revolved once every 10 minutes (144 times as fast as usual) in order to study the structure of the wind with respect to small eddies. Two types of traces were observed--the first under conditions of lapse of temperature, when gusts and lulls of all types were recorded, and the second under inversion conditions when the gusts were absent even under increased wind speed conditions. Work begun in 1925 at Cardington, using Dines anemometers and thermometers on high masts for comparison with conditions lower down, is described, illustrated and discussed. Results of observations with various combinations of instruments and speeds of records are fully presented. Relation of wind structure to temperature at various levels, lapse rates, humidity, rainfall, sunshine, and other factors are shown graphically for two types of eddies. Frequency distribution of accelerations, veering and backing of wind and of duration of gusts are compared. Relation of surface wind to wind at 50 feet eddy energy and eddy pressure, effects of fronts and squalls, etc. are discussed and illustrated. Relation of surface wind to wind at 50 feet eddy energy and eddy pressure, effects of fronts and squalls, etc. are discussed and illustrated, and rules for aid of aeronautics personnel are formulated. A section by C. S. Durst on the theory of eddies, based on studies of Benard, Rayleigh, Low and Brunt and Terada, shows similarity between thermal atmospheric eddies and Berard cells in fluids, using cloud pattern and sketches made from above wind studies as evidence. Ratio of wind at 150 feet to that at 50 feet and to gradient winds are also treated. Theory of turbulence is presented and values of K for various tests are computed with respect to temperature gradient and wind speed.--JAW

13. Heywood, G. S. P. Some observations on fogs and the accompanying temperature gradients. Royal Meteorological Society, Quarterly Journal, 57 (238):97-101, 1931. 2 figs., table DWB M(05) R888q V.57 .

...The table shows the height of the large inversion during 55 fogs at Learfield, Oxfordshire, England, 1929-1930, estimated by the 300 feet

Source No. 13 continued

high mast. The temperature structure up to 300 feet is discussed and illustrated.--JAW

14. Heywood, G. S. P. Wind structure near the ground and its relation to temperature gradient. Royal Meteorological Society, Quarterly Journal, 57(242):433-455, October 1931. eqs., 10 figs., 12 refs., 8 tables. DWB M(05) R888q V.57.

...The wind velocities given in this paper were obtained by two anemometers at heights of 12.7 m and 94.5 m above the ground. Though the diurnal variation of wind velocity at different heights has been worked out by numerous observers, there are not many results from anemometers as high as 95 m; for this reason the ordinary diurnal variation at this height in summer and winter is given below, together with that at 13 m for comparison. The diurnal variation at the two heights in strong, moderate and light winds is then considered, somewhat on the lines of Hellmann's paper. The vertical gradient of temperature up to 87 m is also recorded. Wind gradient must depend largely on temperature gradient, and in the next part of the paper the relation between the difference in wind velocity and the difference in temperature over approximately the same height interval, is worked out for various wind strengths. The various factors controlling the wind gradient are investigated, and the results are found to agree with Taylor's theory of turbulence. The gustiness of the wind is also studied in its relation to vertical temperature gradient and to wind direction. Finally some individual charts, illustrating the various points, are reproduced.--Author's summary

15. Johnson, Sir Nelson K. and Heywood, G. S. P. An investigation of the lapse rate of temperature in the lowest hundred metres of the atmosphere. Great Britain. Meteorological Office, Geophysical Memoirs, No. 77, 1938. 50pp. 19 figs., 13 refs., 31 tables. DWB M(055) G786g v.9,No.77.

...This study is based on a series of hourly observations made on a wireless mast at Leafield, England, over a period of five years (1926-1930). Temperatures were measured at 1.2, 12, 31, 57 and 88 meters; and wind at 13 and 95 meters above the ground. Monthly tables are given showing the hourly mean temperature difference between the various levels, accompanied by mean temperature-height curves for each hour and each month. Special tables give the percentage frequency of occurrence of various magnitudes of lapse rates and inversions, along with the maximum values of both for each month. The effect of wind velocity upon lapse rate and turbulence is discussed. The latter discussion is supported by several tables.--JAW

16. Muethe, A. M. Gust research. 6pp. 1939. 6 figs., 3 tables. DWB M51 M948g.

Source No. 16 continued

...Discusses an investigation to find the factors that determine gustiness, with a view to establishing a basis for predicting the magnitude of the gusts, likely to occur on a given day. The experimental set-up at Lakehurst, New Jersey consists of three towers.--JAW

17. Sherlock, R. H. and Stout, M. B. Picturing the structure of the wind. Civil Engineering, Easton, Pa., 2(6):358-363, June 1932. 5 figs., photos. DWB P Collection.

...A steel experimental wind tower 250 ft high and ten 50 ft wooden towers spaced 60 ft apart were installed on a ridge near Ann Arbor, Mich., with axis normal to prevailing storm winds. Special pressure plate anemometers were designed to give more detail data on structure of gusts than is possible with Robinson type anemometers. The plates had a maximum movement of .005 inches, a response of .12 sec and a natural frequency of 115 cycles/sec. With this setup it was possible to get a horizontal section of a gust at 50 ft and at 60 ft height intervals over a 660 ft front and a vertical section with readings every 50-250 ft elevation. Elaborate vertical and horizontal time cross sections presented here shows lines of iso-velocity indicating the fine structure of the gusts. The results are interpreted so as to give a theoretical picture of air flow in the presence of gusts and the consequent pressure or loads on lines or structures.--M.A.B. 4B-74

1940-1949

18. Berliand, M. E. Teorilia izmeniia vetra s vysotoĭ. (Theory of wind variation with height.) U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, Trudy Naucho-issledovatel'skikh Uchrezhdeniĭ, Ser.1, Meteorologiia, No. 25, Fizika Prizemnogo Sloia Atmosfery, pp 14-67, 1947. 18 figs., 32 refs., 8 tables. DLC.

...The problem of constructing the wind profile up to 1000 m, based on observations at two levels near the ground, is studied. Theoretical basis is discussed at length, and a valuable comparison with observational results is given (relationships between gradient wind and wind velocity at 1 m height, between wind deviation angle and temperature gradient 20 cm-150 cm, between height of friction layer and wind velocity, wind profile, etc.)--M.A.B. 4B-143

19. Church, Phil E. and Gosline, C. A. Jr. Meteorological equipment of the Hanford Engineer Works, Richland, Wash. American Meteorological Society, Bulletin, 29(2):68-73, February 1948. 4 photos. DWB M(05) A512b V.29, No. 2.

...A 400-ft. tower with an anemometer and an aspirated thermohn at each 50-ft interval and a precision wind vane at each 100-ft interval with indicators and recorders in the office building is described. With a "surface" observation level the lapse rate, hence degree of stability, is continuously recorded at nine levels; the character of mixing and amount of dilution of waste stack gases are thereby known.--Author's abstract

20. Frankenberger, Ernst Über den Austauschmechanisims der Bodenschicht und die Abhängigkeit des vertikalen Massenaustauches von Temperaturgefälle nach Untersuchungen an den 70 m hohen Funkmasten in Quickborn/Holstein. (On the exchange mechanism of the surface layer and the dependence of vertical mass exchange upon the temperature gradient, based upon investigations on the high radio masts in Quickborn/Holstein.) Annalen der Meteorologie, Beiheft, 1948. pp. 3-23. eqs., 9 figs., 27 refs., table. DWB M(05) G373a 1948.

...A paper describing the numerous problems connected with measurement of the behavior of turbulent eddies, containing detailed descriptions of the instruments used in measuring the microstructure of the wind and of the calculation methods employed. Vertical exchange is shown to be connected with turbulent fluctuations of a convective nature, including those generated near the ground by friction and those related to short wind fluctuations in which vertical movements of the air greatly surpass the mixing length. Empirical formulas show the dependence of turbulence characteristics on stability, and approximate formulas are derived for the coefficient of vertical austausch for stable and unstable states at a height of 70 m.--M.A.B. 4B-162

21. Frankenberger, Ernst and Rudloff, W. Windmeessungen an den Quickborner Funkmasten, 1947-1948. (Wind measurements on the radio mast in Quickborn, 1947-1948.) Germany. Meteorologisches Amt fur Nordwestdeutschland, Hamburg, 1949. 47pp. figs., 42 tables. DWB M08.59 G373w.

...The vertical wind distribution, made on a radio tower at Quickborn, at heights of 10, 30 and 70 m is discussed. Frequency data for these levels for each day and month from March 1947 through February 1948 are levels for each day and month from March 1947 through February 1948 are given in tables. These measurements are described and compared with longer records made elsewhere. Finally, an analysis of wind variations with season and height over all of Northwest Germany is made, both in tabular form and on a chart.--JAW

22. Frenkiel, Francois N. Mesure de la diffusion turbulente du vent naturel dans le voisinage du sol. (Measurement of the turbulent diffusion of the natural wind in the vicinity of the earth's surface.) Académie des Sciences, Paris, Comptes Rendus, 224(2):98-100, January 1947. 6 eqs., 5 refs. DWB P Collection. Review by Stefan Bergman in: Applied Mechanics Review, 1(10):270, October 1948. DWB P Collection.

...The author made 3 experiments in Jan. 1940 at Lille, using ammonia and recording the percentage (of that emitted) that would be caught at a distance of 72 or 73 cm and a height of 100 or 200 cm, to determine the amount of turbulent diffusion in the atmosphere near the ground. Results are briefly tabulated and discussed.--M.A.B. 4B-147

23. Gerhardt, John R. and Gordon, William E. Microtemperature fluctuations. American Meteorological Society, Journal of Meteorology, 5(5):197-203, October 1948. eqs., 7 figs., 15 refs. DWB M(05) A512j V.5,No.5.

...Selected portions of microtemperature data obtained continuously and with near simultaneity at several levels up to 6 ft over desert surface are plotted on expanded height-time coordinates. The resulting isotherm patterns are shown to be strikingly consistent at all levels and are qualitatively analyzed as a function of the turbulence field present. Correlation coefficients between temperature fluctuations simultaneously at two levels and at a point for various time intervals are evaluated and their variation with separation, time, wind speed and thermal stability is discussed. Tentative intensity and scale measures of turbulence derived from temperature data are presented.--Authors' abstract

24. Golding, E. W. Large-scale generation of electricity by wind-power--preliminary report. British Electrical and Allied Industries Research Association, Technical Report Reference C/T 101, 1949. 15pp. 8 figs., 16 refs. DWB M56.3 G619.

...Discusses tests conducted on hills of suitable shape in Orkneys that gave mean wind speeds up to 15.1 m.p.h. in summer and structure of wind on Costa Head where winds were investigated up to a height of 66 feet. Other trials in progress in North Wales and Cornwall are mentioned. It is concluded that several hundred sites could be found in Britain for economical wind-driven generators giving 3500-4000 kWh/kW. More information required about flow of wind over hills.--JAW

25. Henry, Robert M. A study of the effects of wind speed, lapse rate and altitude on the spectrum of atmospheric turbulence at low altitude. Institute of the Aeronautical Sciences, Report No. 59-43, 1943. 16pp. eqs., 10 figs., 10 refs., table. DWB 629.1303 159re No. 59-43.

...Available wind-tower measurements of atmospheric turbulence are analyzed with emphasis on the spectra which are the concern in airplane response problems. Measured power spectra of the vertical component of velocity and of the horizontal component in the direction of the mean wind, obtained at Brookhaven, N. Y., are converted to space-spectra by assuming that the turbulence is translated at the mean-wind speed. By a statistical analysis, empirical relations are then developed between the spectra of turbulence and mean values of the meteorological parameters wind speed, lapse rate, and altitude above terrain. By curve-fitting methods, a function of these three parameters is found which forms a first-order approximation to the spectrum of turbulence during

Source No. 25 continued

a wide variety of daytime conditions. The results obtained in limited tests of these relations using independent data are also presented. --Author's abstract

26. Huss, P. O. Relation between gusts and average winds for housing load determination. University of Akron, Daniel Guggenheim Airship Institute, DGAI Report No. 140, June 1946. Contract No. Cwb-6103. 23pp. eqs., 60 figs., 3 refs., 13 tables DWB M51 H972r.

...This paper presents a report of an investigation undertaken as a cooperative project between the United States Weather Bureau and the Daniel Guggenheim Airship Institute, Contract No. Cwb-6103. The object of the study was to make detailed wind observations at various levels on a 350 foot tower and to study "their relationships in order to develop methods for reducing maximum winds observed at various heights to estimates at a standard height". Major interest in this study lay in the ratio (f_w) between the peak velocities (V_i) and the "fastest single mile" velocity (V_w) and, also, in the variation with height of the velocities and the above ratio. The ratio appears to vary statistically at a given height and the variation with height follows an inverse expotential relation, $f_w=kh^{-1/n}$. The variation of the velocity with height is, as has been noted by other investigators, a rather erratic factor, but the usual form $V/V_o=(h/h_o)^{1/n}$ is fairly accurate above the 40 foot level. It appears, however, that this exponent varies also with the probability relationship, the average value being in order of 6.5 for the average velocities and 11 for the peaks.--Author's abstract

27. Huss, P. O. and Portman, D. J. Study of natural wind and computation of the austausch turbulent constant. The University of Akron, Daniel Guggenheim Airship Institute, Technical Report No. 1 (DGAI Report No. 149), January 1948. 38pp. 24 refs., 28 figs., 6 tables. DWB M51 D184st No.1 .

...This source contains a description of the micrometeorological station set up by the Daniel Guggenheim Airship Institute. The purpose of the investigation is to obtain simultaneous meteorological data at several levels of a 350 feet high tower and to study the variation of the Austausch Turbulence Constant. Discusses the various types of instruments and their placement on the tower. Sample records of the type to be obtained are included, together with an analysis of a section of one of the systems recorded, to indicate the procedure to be followed in subsequent analyses. The data compiled for this report was obtained between the hours of 0600E and 1400 E on December 16, 1947. Tables present: summary of WBAN-10 weather data; five-minute average data (average downwind velocity, differential temperature and dewpoint temperature) at heights of 6, 40, 100, 160, 220, 280, and 350 feet; summary of hourly data (average downwind velocity, average temperature and dewpoint temperature) at various heights; one-second wind data (instantaneous

Source No. 27 continued

anemometer velocity and instantaneous deviation from average wind direction); and summary of austausch calculations.--JAW

28. Huss, P. O. and Portman, D. J. Study of natural wind and computation of the austausch turbulent constant. The University of Akron, Daniel Guggenheim Airship Institute, Technical Report No. 2 (DGAI Report No. 156), February 1949. 50pp. 36 figs., 19 refs., tables. DWB M51 D184st No.2.

...Results of observations made at various levels on a 350 feet high tower near Akron, Ohio. An intensive program of micrometeorological observations for determining austausch coefficient was carried out and methods, theory, instrumentation and results, together with recommendations for future investigations is given in tables and graphically. Variations of wind with height is difficult to determine accurately. Variations in Richardson number as well as austausch are determined.--JAW

29. Mal, S., Desai, B. N. and Sircar, S. P. An investigation into the variation of the lapse rate of temperature in the atmosphere near the ground at Drigh Road, Karachi. India. Meteorological Department, Memoirs, 29(1):1-53, 1942. 11 figs., 18 tables. DWB M(055) 139m V.29, No.1.

...The paper gives a description of the arrangements made at the Karachi Airport for obtaining continuous records of temperature in the lowest 260 ft. of the atmosphere there. Diurnal, seasonal and annual variations of temperatures and lapse rates together with their variations on clear and cloudy days and nights are discussed. (Also presented in tables.) The growth and decay of nocturnal inversion and the lapse rate associated with the development of fog have been considered in detail.--Authors' abstract

Data presented are for the period of August 1930 to July 1931.--JAW

30. Nägeli, Werner Weitere Untersuchungen über die Windverhältnisse im Bereich von Windschutzstreifen. (Further investigation of wind conditions in the vicinity of wind breaks.) Schweizerische Anstalt für das forstliche Versuchswesen, Zürich, Mitteilungen, 24(2):659-737, 1946. 25 figs., refs., 6 tables. Microfilm DWB SF-349.

...A continuation of work done in 1942-43. Chief objects of the new investigation were to determine effects on wind of narrow pine hedges 3-17 m wide and 7-17 m high, of deciduous hedges 12-15 m wide and 3-18 m high, and of combination wind breaks and orchards. Effects of a 1 m high snow fence, of a double row of deciduous trees and of 12 other wind obstructing objects were investigated.--JAW

31. Sapozhnikova, Serafima Afas'evna, Izmenenie skorosti vetra s vysotoĭ v nizhnem sloe vozdukha. (Variation of wind velocity with height in the air layer near the ground.) U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzby, Trudy Nauchno-issledovatel'skikh Uchrezhdeniĭ, Ser. 1, Meteorologiia, No. 33, 1946. 103 p. figs., tables, refs., eqs. DWB M(055) U581tn Ser.1.

...A theoretical and experimental analysis of the vertical stratification of wind velocity in the lower 50 m of the atmosphere. This study begins with a review of the fundamental laws of the variation of wind velocity with height in the lower level of the atmosphere and of the various methods used for measuring wind and temperature in the lower atmospheric layers in 1943-44. The remaining chapters are as follows: the laws of the variations of wind velocity with height in the lower atmospheric layers over open level places; the laws of the spatial variations of the factors determining the vertical wind profile; and the wind velocity in the lower atmospheric layer in the European U.S.S.R. Data are presented tabularly and graphically.--M.A.B. 4B-141

32. Sapoznikova, Serafima Afanas'evna Nekotorye osobennosti v raspredeleniĭ temperatury, viazhnosti i vetra v prizemnom sloe vozdukha. (Some peculiarities in distribution of temperature, humidity and wind in the air layer near the ground.) U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, Trudy Nauchno-issledovatel'skikh Uchrezhdeniĭ, Ser. 1, Meteorologiia, No. 39, Fizika Prizemnogo Sloia Atmosfery, p.44-57, 1947. 10 figs., 4 refs., 2 tables. DWB M(055) U581tn Ser.1, No.39.

...These investigations were made by the Arys' expedition of the Central Geophysical Observatory in the summer of 1945 over bare and covered surfaces. For the measurement of wind velocity the English "Meteor" anemometers were used at heights from 0.06 to 5.0 m and the usual electric anemometer at a height of 10.8 m. The temperature and humidity observations at heights of 0.05 m; 0.2 m, 0.5 m and 1.5 m were made by means of Assman psychrometers. Daily variations of these elements and their interrelations are analyzed and discussed. 1. Tower observations 2 Micrometeorological profiles--M.A.B. 4B-156

33. Shiotani, Masao and Yamamoto, Gi-ichi Turbulence in the free atmosphere. (1st Report.) Geophysical Magazine, Tokyo, 20(1):21-30, November 1948. eqs. 5 figs., refs., 5 tables DWB P Collection.

...Following the line of research of Taylor, intensity and scale of turbulence and eddy viscosity are calculated from five minute records, using wind velocity fluctuation data recorded at 38, 41, 44, 47 and 50 m above the ground at Maebashi broadcasting station by hot wire anemometers.--JAW

34. Thornthwaite, Charles W. and Halstead, Maurice Note on the variation of wind with height in the layer near the ground. American Geophysical Union, Transactions, 23(2):249-255, 1942. 8 eqs., 6 figs., 15 refs., 2 tables. DWB P Collection.

...Presents samples of low-level wind velocity observations made in various localities. Some of the problems that are raised are outlined. Results indicate that a "law which describes the change of wind-velocity with height is a combination of logarithmic and power-lows."--JAW

35. Thornthwaite, C. W. and Kaser, P. Wind-gradient observations. American Geophysical Union, Transactions, 24(1):166-182, 1943. 8 figs., 4 refs., table. DWB P Collection.

...From wind gradient records made for more than a year at New Philadelphia, Ohio, with low velocity measuring anemometers, the hourly observations of velocity at various levels up to 28 feet and direction at 28 feet for 31 selected days are tabulated. Some data are presented graphically to show that the "logarithmic" law of wind structure is valid only during the morning and evening when the thermal structure of the lower atmosphere is adiabatic.--JAW

36. Timofeev, M. P. and Ogneva, T. A. Operativnyĭ metod opredeleniia koefitsienta turbulentnogo obmena na osnovanii nabliudenii nad verikal'nym profilem vetra: raschet teploobmena i vlagoobmena zemliavozdukh. (Operative method for determination of the coefficient of turbulent exchange on the basis of observations of the vertical wind profile: calculation of heat and moisture exchange between Earth and atmosphere.) Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy, 20(82):16-28, 1949. 16 figs.,table, 13 eqs.--DLC.

...Wind profiles were measured for 2 to 16 m by means of recording electrical contact anemometers. Equipment and procedure are described. A series of nomograms is presented for the computation of auxiliary parameters, the coefficient of exchange itself, as well as for the heat and moisture exchange between the soil and atmosphere. The paper is entirely based on the turbulence theory of LAIKHTMAN, which meanwhile has proved to be inadequate. M.G.A. 14.3-670

37. Yamamoto, G. and Shiotani, N. Turbulence in the free atmosphere (1st and 2nd reports). Geophysical Magazine, Tokyo, 20(1):21-30 and 105-111, November 1948. 9 figs., refs., eqs., 10 tables. DWB P Collection.

...Wind velocity fluctuations were recorded at 50, 47, 44, 41 and 38 meters above the gound at Maebashi broadcasting station (50 miles northeast of Tokyo) by hot-wire anemometers. Following the line of research of G. I. Taylor, intensity and scale of turbulence and eddy viscosity were calculated from five minute records.--JAW

1950 - 1959

38. Agarwale, K. S. The diurnal and seasonal variations of the surface wind at Visakhapatnam. Indian Journal of Meteorology and Geophysics, 4(1):76-81, Jan. 1953. figs., 4 tables, 2 refs., DWB M(05) I 39i, V.4, No. 1.

...This paper discusses the diurnal and seasonal variations of the wind at Visakhapatnam at a height of 56-1/2 ft above ground based on three years' data 1939-41. Curves showing the mean diurnal variation of the wind speed for the twelve months of the year are given and discussed; these curves show a strong maximum in the early afternoon. A rough estimate of the value of the coefficient of eddy diffusion works out to be 137 in C.G.S. units. Tables of frequencies of prevailing wind direction at 3-hourly intervals for each month of the year are given and their main features are described; a table showing the diurnal variation of "calms" is also included. The general characteristics of land and sea breezes occurring at the station are briefly mentioned. The annual variation of the speed and direction of wind as well as its steadiness is also briefly discussed. The mean monthly steadiness is found to vary from 60 to 92 per cent.--Author's abstract

39. Arzt, Theodor, Die Windverhältnisse in der Rhön unter besonderer Berücksichtigung der Ausnutzbarkeit des Windes als Energiequelle. (Wind conditions in the Rhön range with special reference to the utilization of the wind as a source of energy.) Germany. Deutscher Wetterdienst in der U.S.-Zone, Berichte, No. 21, 1951. 31 p. diagrs., tables, graphs, biblio. Price DM 3. DWB M(055) G373b No. 21.

...Wind velocity and direction were determined by means of self-recording cup anemometers at elevations of 0.5 m to 16.0 m above the ground at the stations Hochrhön and Wasserkoppe. The author discusses the topography of the terrain over which the observations were made, the method of making the observations and of determining themean wind velocity, the frequency of the mean velocity of the individual wind directions, distribution of the hourly means into wind velocity classes, the daily march of the wind, the yearly march of wind velocity, high wind velocities, gustiness of the wind and the meteorological considerations involved in the construction of wind power installations. The data on wind velocities are given in tables.--M.A.B. 3.8-128

40. Barad, Morton L. Analysis of diffusion studies at O'Neill. Advances in Geophysics, N. Y., Vol. 6, pub. 1959. p. 389-398. 4 figs., table, 6 refs., 4 eqs. DWB 551.082 A244 V.6.

...The Taylor hypothesis has been applied to the diffusion measurements and the micrometeorological data gathered in Project Prairie Grass in order to determine the Lagrangia correlation coefficient for lateral motion for time-lags corresponding to downwind travel of from 50 m to 800 m. In determining this coefficient it is necessary to compute

Source No. 40 continued

the second derivative with respect to time of the variance of the lateral distribution of mean concentration at points downwind from a continuous point source. An objective technique for computing this derivative is described. A preliminary analysis of thirteen experiments indicates that, for time-lags between about five and sixty seconds, the Lagrangian correlation coefficient R_L may exceed the Eulerian correlation coefficient R_E in some experiments, be equal to it in others, and be less than it in still others. There is a tendency for $R_L - R_E$ to decrease as the mean wind speed decreases and as the stability ratio increases.--Author's abstract.

41. Best, A. C. et al Temperature and humidity gradients in the first 100 m over south-east England. Great Britain. Meteorological Office, Geophysical Memoirs, No. 89, 1952. 60 p. eqs., 18 figs., 2 refs., 28 tables. DWB M(055) G786g No. 89.

...Investigation of the distribution of temperature and humidity in the lower layer of the atmosphere at Rye, Sussex, England. Temperature and humidity were recorded over the period July 1945 to June 1948 on a steel tower at heights of3.5, 50, 155 and 350 feet. Tables present the following data: monthly mean hourly values of temperature differences and humidity differences over 3 height intervals; mean hourly values of temperature differences and humidity differences over 3 height intervals for clear and overcast days during summer and winter; monthly, year by year, maximum hourly values of temperature and humidity lapse and temperature and humidity inversions over 3 height intervals; and monthly percentage frequency of occurrence of temperature difference and humidity difference of various values over 3 height intervals. The 3 height intervals referred to are 3.5 to 50 feet, 50 to 155 feet and 155 to 350 feet.--JAW

42. Bowne, Norman E. Measurements of atmospheric diffusion from an elevated source, U. S. Atomic Energy Commission. 6th Air Clearning Conference, July 1959. pp.76-88. eqs., 7 figs., 10 refs., 3 tables. DWB M10.42 U581ai 6th 1959.

...Diffusion from an elevated source under lapse conditions was measured utilizing uranine dye as a tracer. Comprehensive measurements of temperature and vertical and horizontal wind fluctuations were made at several levels on a 150-foot tower. The meteorological parameters are correlated with the ground-level air concentrations in an effort to establish predictors directly from Eulerian meteorological data. The effects of wind direction shear in the vertical on the maximum ground concentration is discussed. Techniques of dispersal, collection, analysis and the results of particle size counting are included. Diffusion parameters measured from the dye concentrations are included and compared with those presently used at the National Reactor Testing Station. --Author's abstract

43. Brocks, Karl Temperatur und Austausch in der untersten Atmosphäre. (Temperature and exchange in the lower atmosphere.) Deutscher Wetterdienst in der U. S. Zone, Berichte, No. 12, pp. 166-170, 1950. eqs., 4 figs., 16 refs. DWB M(055) G373b No. 12.

...The vertical variation with temperature in the lowest layer (up to 100 meters) depends on lability or stability (inversion) due to ground-air temperature difference. The height function of potential temperature follows a power law with negative index in labile and positive in stable air, and is a measure of vertical exchange. The frequency distribution of the indices at different heights is shown in diagrams. --JAW

44. Church, Phil E. The micrometeorological installation of the University of Washington. (In: U. S. Technical Conference on Air Pollution, Washington, D. C. 1950. Air Pollution proceeding. 1952 p. 812-814. 2 figs.) DWB M10.42 U58ai.

...Describes the construction of a tower, the terrain on which the tower is located (a turbulent location), the instrumentation of both the tower and a mast, etc.--JAW

45. Cramer, Harrison E. Preliminary results of a program for measuring the structure of turbulent flow near the ground. U. S. Air Force, Cambridge Research Center, Geophysical Research Papers, No. 19:187-205, December 1952. 17 figs., 11 refs., table. DWB M(055) U58g No. 19.

...A detailed study of the structure of atmosphereic turbulence is in progress. One objective of this study is the measurement of the scale and intensity of turbulent flow with particular emphasis on their diurnal variation. Hot-wire type anemometers serve as wind speed indicators and small balsa wood airfoil sections that drive a selsyn system serve as wind direction indicators. The response time for both types of instrument is about 0.25 sec. Data are recorded by taking lapse-time photographs of a panel at intervals of 1 sec; the average sampling time is about 8 min. The observations to date have all been obtained at a standard height of 2.5 m in a large field. A general description of the wind speed and wind direction fluctuations thus obtained is given and the tendency for the frequency distributions of both these quantities to be Gaussian is noted. The intensity of turbulence $(\overline{V'^2})^{1/2}/\overline{V}$ has been computed for thirteen cases, the average value being about 0.25 and the range being from 0.12 to 0.33. Several examples of the transverse and longitudinal scales of turbulence are presented, and the dependency of both the scale and intensity upon the time interval over which mean values are taken is investigated. The longitudinal and transverse gradients of wind speed for short-period fluctuations are also discussed.--Author's abstract

46. Crutcher, Harold L. Effectiveness of small-scale turbulence in the meridional flux of zonal momentum. Thesis (M.Sc.)-New York University, June 1951. 17p. eqs., 5 figs., 5 refs., 3 tables. Typed manuscript. DWB M51 C957e.

Source No. 46 continued

...The relative contribution of three small scales of turbulence and their combined contribution to the meridional flux of zonal momentum are investigated for five cases during the fall of 1950. The scales are all less than one hour with the smallest being less than one minute. The basic data were obtained from Aerovane and bivane records of the 126 and 109 meter levels on the "Ace" tower at the BrookhavenNational Laboratories, Upton, L. I., N. Y. The small scale eddy meridional flux of zonal momentum amounts, at most, to less than two percent of the meridional flux of the total motion. Effective scales of turbulence over long period, contributing to the earth's momentum balance, are, therefore, presumed to be of the order of six hours or more.--Author's abstract.

47. Dätwyler, Gottfried Méthode nouvelle et rapide pour obtenir l'echelle de la turbulence avec l'anémomètre à deux fils chauds. (New rapid method for obtaining the turbulence scale with a two-hot-wire anemometer.) Académie des Sciences, Paris, Comptes Rendus, 240(12):1312-1313, March 21, 1955. ref. DWB P Collection.

...A new method enabling one to rapidly obtain a characteristic length of the same order as the value of turbulence scale L defined by the integral $L=\int_0 R(y)dy$, by means of varying the distance between the two parallel and identical hot wires and opposed electrically up (even) to a value y for which the determinations $\overline{(u_1-u_2)}$ obtained would be equal to the value of turbulence $\overline{u}_2$ obtained with only one or the other of the two hot wires.--M.A.B. 6.10-177

48. Davidson, B. and Halitsky, J. A method of estimating the field of instantaneous ground concentration from tower bivane data. Air Pollution Control Association, Proceedings, Vol. 50, 1957. Paper No. 29. 4p. eqs., 8 figs. DWB M10.42 A298ap V. 50.

...The purpose of this paper is to present a simple hypothesis enabling one to estimate the field of instantaneous concentration is then meaned over a period of 1 hour and it is shown that these time mean concentrations yield about the same results as a Sutton or Bosanquet type formula. A large part of the observational material presented was taken at Buchanan, New York.--JAW

49. Davidson, Ben and Lettau, Heinz (U.S.A.F., Cambridge, Res. Center), The Great Plains turbulence field program. Weatherwise, 6(6):166-169, Dec. 1953. illus. DWB .

...The project described in this article was organized by the Air Force Cambridge Research Center to study wind, turbulence and diffusion in the lower 5000 ft of the atmosphere. The various government institutions and universities collaborating in this project sent representatives and special equipment which was installed and operated on a section 6 mi

Source No. 49 continued

east of O'Neill, Nebraska, during Aug. and Sept. 1953. A total of 174 hours (7 complete days) of intensive observations of simultaneous turbulent wind, temperature and moisture conditions and gradients, and outgoing and incoming radiation as well as soil moisture and temperature conditions were obtained and are being analyzed. Smoke puffs and tandem (vertical) balloons were used to study wind structure. G. Loeser lost his life in a helicopter accident.--M.A.B. 57-114

50. Deacon, E. L. Gust variation with height up to 150 m. Royal Meteorological Society, Quarterly Journal, 81(350):562-573, October 1955. eqs., 5 figs., 15 refs., 5 tables. DWB M(05) R888q V.81.

...Measurement, on occasions of strong wind, of horizontal wind gusts at heights of 12, 64, and 153 m in open country (Sale, Victoria) show the increase of gust speeds with height to be markedly less than that of mean wind speed. Lack of synchronism between gusts at the various heights make it necessary, for wind-pressure applications, to examine the maximum values of wind speed averaged over the three heights. At the times of occurrence of these maxima, the wind speed is approximately proportional to the height raised to the power 0·85. The corresponding index for the mean speed is 0·16. Some results on the structure of turbulence are applied to enable prediction of extreme vertical gust velocities to be made.--Author's abstract

A table gives the results of observations of wind speeds at heights of 40, 210 and 503 feet on a radio mast.--JAW

51. Deacon, E. L. Vertical profiles of mean wind in the surface layers of the atmosphere. Great Britain. Meteorological Office, Geophysical Memoirs, No. 91, 1953. 68p. eqs., 33 figs., 53 refs., 20 tables. DWB M(055) G786g No. 91.

...A set of sensitive recording cup anemometers was installed in 1941 over an open grassland site at Porton, Wiltshire, adjacent to equipment for recording vertical temperature gradient. The wind-profile observations obtained there up to 1945, together with some data for other surfaces including the sea, have been analysed with particular attention to the effects of roughness of the surface and of thermal stratification. The well known logarithmic relationship of Prandtl is shown to be a very adequate representation of the wind profiles under neutral conditions. For other conditions of stability the form of the wind profiles and the gustiness of the wind is found to be satisfactorily related to the Richardson number except under very stable conditions. The effect of thermal stratification on the wind profile is small near the surface but increases markedly with height, in keeping with the fact that the Richardson number is very close to zero at the surface

Source No. 51 continued

and increases numerically almost linearly with height. A generalized wind-profile relationship is proposed which enables the eddy viscosity to be evaluated, and this is compared with some previous formulations. Observations bearing on the critical value of the Richardson number for the onset of turbulence are discussed in relation to the laboratory results of Reichardt.--Author's abstract

52. DeMarrais, Gerard A. Wind-speed profiles at Brookhaven National Laboratory. American Meteorological Society, Journal of Meteorology, 16:181-190, April 1959. eqs., 3 figs., 15 refs., 8 tables. DWB M(05)A512j V16.

...Wind-speed profiles are determined for a 114-m layer and two continuous parts of that layer through the use of data from the 125-m meteorological tower at Brookhaven National Laboratory. Further analysis of the data indicates that some variations in the profiles can be attributed to differences in wind speed and direction. A comparison of results obtained through the use of the power law and the logarithmic law shows that the former more accurately fits the data. The profiles determined in this study are found to be in agreement with those found in an independent investigation made at Brookhaven. The results of this investigation are also compared with those obtained at ten other locations.--Author's abstract

53. Ely, Robert P., Jr. (Geophysics Research Directorate), Vertical gustiness up to 1200 meters as derived from smoke puff trajectories. (In: Lettau, H. H. and Davidson, Ben. (eds.), Exploring the atmosphere's first mile. N. Y., Pergamon Press, 1957. Vol. 1:373-376. fig., 2 tables.)DWB M51 U581ex.

...An attempt to determine the significant features of the distribution of vertical movements of smoke puffs and to detect the principal causes of these features. The means and standard deviations of the vertical velocities are presented in a table. From an analysis of the data it is concluded that the "variance of the vertical component of air motion as derived from the vertical displacement of smoke puffs over horizontal trajectories of several hundred meters illustrates the thermal character of the vertical gustiness on clear days in the range from 100 to 1200 m above the ground." The standard deviations of vertical motion as derived from smoke puff trajectories are compared with those measured by PBY flights and a high degree of similarity between them is noted.--M.G.A. 10.11-178

54. Franceschini, Guy A. (Principal Investigator) Forecasting micrometeorological variables. Texas. Agricultural and Mechanical College, Department of Oceanography and Meteorology. Contract AF 19(604)-2250, Final Report, December 1959. 65p. figs., refs., tables. DWB M84 T355f 1959.

Source No. 54 continued

...An objective evaluation was conducted on the utility of a specialized analogue computer for micrometeorology. Values of parameters simulated by the computer are compared with values observed. Parameters of concern were: air temperature at a height equal to the roughness parameter (z_o); air temperature at 2 m; temperature difference between 1/2 m and 4 m; wind speed at 2 m; vapor pressure at 2 m; and relative humidity at 2 m. Results are shown in graphs of simulated and observed values as a function of time, and tables of statistical parameters of the verification. Comparisons were made for five (5) different periods involving four (4) locations. The locations, all in Texas, represented appreciably different surfaces. Meteorological conditions were varied and included the following air mass types: arctic, maritime polar, continental polar and maritime tropical. A brief description of each site with a summary of its attendant meteorological conditions is given. Although appreciable difficulty was experienced in keeping the computer in operation, in general the simulated results were good. However, the computer tends to minimize the diurnal amplitude of the variables. Weakest areas of the computer were: temperature lapse rate when strong stability was observed; vapor pressure when high values existed; and wind speed, generally. Suggestions for future work are given.--Author's summary

55. Franke, Martin, Die Höhen- und Zeitabhängigkeit des Austauschkoeffizienten in der Bodenschicht. (The dependence of the austausch coefficient in the surface layers on altitude and time.) Geofisica Pura e Applicata, 20:87-130, July-Dec. 1951. 6 figs., 7 tables, 20 refs., numerous equations. In German; English and German summaries p. 87-88. DWB P Collection.

...Based on micrometeorological data for Leafield, England (N. K. Johnson and G. S. P. Heywood) and Ismaila, Egypt (W. D. Flower), certain periods have been selected to illustrate the diurnal, seasonal and climatic variations in eddy diffusivity with respect to heights, and under varying cloudiness, wind and radiation conditions. Data obtained by Fritzsche and Stange, and by Lettau for Z=10 to 70 m are compared with data obtained in this study for day, night and mean conditions on a clear June day. Present data agree up to 30 m but at 70 m are 1/2 of earlier values cited. --M.A.B. 38-129

56. Frankenberger, Ernst Investigation of the vertical exchange in the lower decameters. Translated from: Annalen der Meteorologie, 1951, 4(7-9): 358-374, by Angelo F. Apano, U. S. Weather Bureau. 26p. eqs., 19 figs. DWB M08.8 F829in.

...Details are given on new instruments for measuring slight differences of temperature or humidity. A new procedure is used for testing vertical profiles of temperature as to the existence of internal

Source No. 56 continued

boundary layers. Homogeneous profiles of vertical gradients of temperature, wind velocity and humidity, measured near Quickborn/Holstein in the lowest atmospheric layers above the microclimate zone on wind-forces exceeding 3m/sec are shown to be not at variance with the theoretical estimates of the boundary layer theory. That theory, however, applies to the vertical exchange of heat and atmospheric pollutions up to that level only. Differences between the vertical exchange coefficients for heat and impulse arise in case of convection. Under certain conditions it is possible to determine how much the convection and how much the turbulent exchange contribute to the total exchange. The results of the first experiments made to test methods for the determination of vertical exchange coefficients are given. Various comparisons agreed in inferring from the measurements, carried out up to now in the shallow valley of the Pinnau, that the vertical exchange of momentum was about 40% smaller than the mean value of the vertical exchange found over more extended plain areas. The temperatures and humidities as well as their vertical gradients are accordingly larger than over plains.--Author's abstract

57. Frankenberger, E. F. H. Investigation of the vertical exchange within the lowest decameters at Quickborn. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 19:323-343, December 1952. 18 figs., eqs., 12 refs., appendix. DWB M(055) U58g No. 19.

...Instruments to measure vertical differences of dry- and wet-bulb temperatures were made. Vertical profiles of temperature, moisture, and of the total heat content were computed and tested for the presence of horizontal gradients. The upper limit of heights has been examined within which the observed gradients of temperature, moisture, and wind are in accordance with the turbulence theory of Lettau.

This limit varies with conditions favorable for convection. Apparent differences between the vertical Austausch coefficients of momentum and the vertical Austausch coefficients of heat which occur at heights of several meters above the ground have been explained as the result of convection. A simple method of specifying the friction velocity has been verified with the help of heat balance determinations. Very small undulations of the ground influence the results and reduce the vertical Austausch coefficient at 8-m altitude by about 20 per cent. The effects of temperature stratification on the amplitude of temporal velocity variations of various duration have been examined by means of fine structure records.--Author's abstract.

58. Frankenberger, Ernst "Über das vertikale Gefälle der Luftfeuchtigkeit und die Verdunstung bei Quickborn/Holst. (On the vertical gradient of humidity and evaporation at Quickborn/Holstein) Germany. Deutscher Wetterdienst in der US-Zone, Berichte, No. 12, p. 45-51, 1950. 4 figs., table, refs., eqs. DWB M(055) G373b No. 12.

Source No. 58 continued

...Specific humidity measured hourly at 2, 13, 28 and 70 m height on 29 days, using electrically ventilated instruments. These gave the austausch coefficients at various heights and temperatures. The ratio 1.4:1 between vertical coefficients for heat and humidity, and for momentum, was confirmed. Evaporation was calculated from humidity gradient and austausch coefficient for rain days and days with wet and dry ground.--M.A.B. 4B-213

59. Frankenberger, Ernst Über vertikale Temperatur-,Feuchte- und Windgradienten in den untersten 7 Dekametern der Atmosphäre, den Vertikalaustausch und den Wärmehaushalt an Wiesenboden bei Quickborn/Holstein 1953/1954. (Vertical temperature, humidity and wind gradients in the lowest 7 dekameters of the atmosphere; the vertical exchange and the soil heat economy of meadows near Quickborn/Holstein, 1953/1954.) Germany. Deutschen Wetterdienstes, Berichte, 3(2), 1955. 16 p. 24 figs., 11 refs., 29 tables (some fold.). DWB M(055) G373ba V.3, No. 2.

...A continuous series of hourly micrometeorological data for Sept. 1953 through August 1954, for 2, 10, 28 and 70 m above the ground on the Quickborn radio tower located 20 m N. of Hamburg at 53°44'05"N and 09°52'53"E and 12-1/2 m above sea level, is thoroughly analyzed and the results presented in this monograph in extensive tables, diagrams and illustrations. The soil temperature at 2, 5, 10, 20, 50 and 100 cm depth, the evaporation and temperature and lapse rate, vapor pressure and vapor pressure gradient, wind, insulation and radiation balance are considered. Inversion, fog (64 cases), vertical austausch and water vapor transport, hourly temperature changes, etc. on clear days and nights are calculated.--M.A.B. 7.8-8

60. Frankenberger, Ernst, Untersuchungen über den Vertikalaustausch in den unteren Dekametern der Atmosphäre. (Investigations of the vertical exchange in the lowest dekameters of the atmosphere.) Annalen der Meteorologie, 4(7/9):358-374, 1951. 18 figs., 15 refs., 9 equations. German and English summaries p. 358. Addensum: p. 374, fig. DWB M(05) G373a V.4.

A new, sensitive, electrically recording Assmann psychrometer is described. Four were used at Quickborn (Holstein) to record temperature and humidity differences between 70, 28, 13 and 2 m heights above a plain, in conjunction with horizontal and vertical wind velocity records. These profiles agree with estimates by the boundary-layer theory. Nature and influence of convective exchange are discussed. The ratio between geostrophic wind and that at 70 m is related to difference of potential temperature 70-10 m. Some calculations are made of shares of convection and turbulence in total exchange. Observations in a shallow valley showed that vertical exchange of momentum averaged 40% less than over large plains; surface temperature and humidity

Source No. 60 continued

and their vertical gradient are consequently greater in such valleys.--M.A.B. 3.10-4

61. Frankenberger, Ernst Zur Anisotropie der atmosphärischen Grenzschichtturbulenz. (Anisotropy of the atmospheric boundary layer turbulence.) Annalen der Meteorologie, Hamburg, 8(3/4):93-97, 1957. 4 figs., table, 9 refs., 4 eqs. DWB M(05) G373a V.8.

...The author studied the spectral distribution of turbulent wind oscillations and their dependence upon wind velocity and height above the surface for the simplest case of an adiabatic temperature stratification. This spectral distribution of turbulent velocities up to 70 m above the ground was studied at the Quickborn measuring field of the Hamburg Meteorological Observatory and the results of studies on turbulent wind velocities under thermal adiabatic stratification published by E. K. Webb (see 7.10-201, Oct. 1956, MAB); M. Shiotani (see 4B-239, Feb. 1953, MAB); and H. A. Panofsky (see 5.9-185, Sept. 1954, MAB) etc., are analyzed. The analysis of the fine wind structure is carried out by the mathematical technique of G. I. Griffith and E. L. Deacon. It is evident that the spatial spectrum is independent of the wind velocity and that, in as far as the temperature stratification is adiabatic, the horizontal extensions of the turbulent elements carrying the vertical exchange increase with the square root of the altitude.--M.G.A, 10.7-242

62. Friedman, Don G. The height variation of lateral gustiness and its effect on lateral diffusion. American Meteorological Society, Journal of Meteorology, 10:372-379, October 1953. eqs., 8 figs., 11 refs., 6 tables. DWB M(05) A512j V.10.

...Data derived from a unique observational arrangement at Round Hill Field Station allow the investigation of the instantaneous vertical variation of wind-direction fluctuations in the lowest 44 m of the atmosphere. Three observational runds under different thermal conditions have been analyzed. An estimate, from these data, of the vertical distribution of lateral diffusion is given in terms of the variation of Sutton's lateral diffusion coefficient with height. The computed values of this coefficient are found to be somewhat larter than those given by Sutton.--Author's abstract

63. Gerhardt, J. R. and John, K. H. Further studies of the turbulent transfer of heat near the earth's surface. Texas, University, Electrical Engineering Research Laboratory, Report No. 43, November 1950 n.p. 29 figs., 7 refs., 7 tables. DWB M84 T355r No. 43.

...The eddy flux of heat is derived from micrometeorological data obtained at Manor, Texas on August 3-4, 1948, January 24-25, 1950 and February 22-23, 1950 using theory presented by Lettau. Computations

Source No. 63 continued

include radiation and heat transfer from air to soil and vice versa, from temperature and wind profiles based on detailed measurements. A comprehensive presentation a nd analysis of data.--JAW

64. Gill, Gerald C. Micrometeorological instrumentation at M.I.T.'s Round Hill Field Station. U. S. Air Force, Cambridge Research Center, Geophysical Research Papers, No. 19:171-185, December 1952. figs. DWB M(055) U58g No. 19.

...Detailed description of instrumentation used on a 144 foot permanent tower and on a 36 foot portable tower (hot wire anemometers with ultrafast response, light weight bivanes, thermocouples). A heat flux instrument is under development, which would measure continuously the vertical turbulent velocity and the temperature anomaly and give an output that is proportional to the instantaneous value of their product.--JAW

65. Goptarev, N. P. Nekotorye rezul'taty gradientnykh issledovanii v raione Neftianykh Kamnei. (Results of investigation of gradients near Neftyanye Kamni.) Moscow. Gosudartstvennyi Okeanograficheskii Institut, Trudy, No. 36:128-157, 1957. 8 eqs., 11 figs., 17 refs., 10 tables. DWB P Collection.

...The wind force upon marine oil drilling installations in the Apsheron marine district was investigated in 1954-1955, by means of a detailed analysis of the vertical distribution of wind velocities in the lower 50 m layer of the atmosphere. The gradient installation was on a drilling tower, 50 m above sea level, located 22 mi from the nearest bank. The mean wind velocities were measured with electrical contact three cup anemometers. Velocity pulsations were measured with a low inertia brake anemometer with a 21 cup receiver and a potentiometer bridge. Details of measurement of wind direction, temperature and humidity, calibration and the effect of the mast itself upon the readings,are discussed. The results of measurements indicate the following: the vertical wind profile in the lower 50 m layer of the atmosphere at velocities above 15 m/sec depends slightly upon stratification of the air and for practical purposes it can be described by the logarithmic law with a roughness parameter of Z_2=0.06 cm. The wind gustiness in the atmospheric layer near the ground is irregular; the magnitude and duration of gusts vary within very wide limits. The mean magnitude of gusts in second intervals is 1.0-1.1 of the mean velocity for 10 minutes. The largest gusts attain 1.6-1.7 of the mean velocity. The distribution of gust magnitudes in a wind current can be described approximately by the Gaussian curve. The relative wind gustiness ($K=U_{max}/U_{mean}$) diminishes gradually with distance from the underlying surface. With increase of velocity to 10-12m/sec the relative gustiness begins to increase slightly. In stable air the relative gustiness is greater than in unstable air as a result of slight vertical mixing. At high wind velocities the gustiness depends

Source No. 65 continued

slightly upon stratification. The vertical variations of wind velocity in the Apsheron district are slight. The relevant equations for analyzing the gradient wind behavior and numerical data, and graphs are presented and an appendix contains tables with observations on vertical distribution of wind , temperature and humidity in the Neftyanye Kamni district during 1954-1955, and mean wind velocities (for 10 min) as measured with the braked anemometer of D. Ia. Surazhski (U) and extreme wind velocities in gusts for 10 min (U_{max} and U_{mean}).--M.A.B. 10.11-191

66. Goptarev, N. P. On certain characteristics of wind gustiness. Translation prepared by Liaison Office, Technical Information Center, MCLTD, Wright-Patterson Air Force Base, Ohio, F-TS-9872/V. Source: Meteorologiia i Gidrologiia, No. 5:45-49, May 1957. 13 p. eqs., 2 figs., 3 refs., 2 tables. DWB M51 G6590n.

...The author states that conclusions, drawn by V. S. Bolsshakov in his article "On the quantitative characteristics of wind gusiness" in Meteorologiia i Gidrologiia, No. 3, 1955, are erroneous. He examines these conclusions in greater detail. His examination is based primarily on material yielded by special observations which were conducted by State Oceanographic Institute on the Caspian Sea during 1954-1955. Retarded tensometric anemometers were installed on an oil-well derrick at a distance of approximately 22 miles from the cosest seashore, and at heights of 6, 15, 27 and 51 meters above sea level.--JAW

67. Halstead, M. H. (Principal Investigator) Forecasting micrometeorological variables. Texas. Agricultural and Mechanical College, Department of Oceanography and Meteorology. Contract AF 19(604)-1117, Final Report, March, 1957. 272p. figs., eqs., refs., tables. DWB M84 T355f 1957.

...This report summarizes the results of a three year (June 1, 1954 to May 30, 1954) research study done at a site in O'Neill, Nebraska. Site and equipment are described and illustrated. The mobile station, telemetering circuits, design of an analogue computer for prediction of micrometeorological parameters from surface conditions and meteorological observations and the basic data are described, illustrated or presented. --JAW

68. Halstead, Maurice H., The fluxes of momentum, heat, and water vapor in micrometeorology. Johns Hopkins Univ. Laboratory of Climatology, Publications in Climatology, 7(2):326-358, 1954. 23 figs., 2 tables, 2 refs., 85 eqs. Append. p. 359-361. DWB M8 J65p V.7, No. 2.

...A systematic development of equations for a rational computation of the heat budget, based on data obtained on the O'Neill expedition. The discussion starts with relevant aspects of the kinetic theory of gases, laminar flow, flux of momentum and proceeds to effects of surface roughness. The author considers now the effect a vertical gradient in shearing

Source No. 68 continued

stress as negligible for micrometeorological purposes. Surface drag measured in the field compares well with the theory. An analysis of smoke puff diversions was made, suggesting that the concept of distorted surfaces might substitute vertical and horizontal variations of the exchange coefficient. Further thoughts and evaluations are devoted to temperature profiles, heat flux and water vapor flux. The percentage of heat used for evaporation is closely related to soil moisture.--M.A.B. 89-296

69. Hay, J. S. Some measurements of vertical profiles of wind speed and gustiness over sea. Porton, England. Chemical Defence Experimental Establishment, Porton Technical Paper, No. 428, 1954. 16 p. 5 plates, 4 tables, 8 refs., 8 eqs. Mimeo. DWB M(055) G786n No.428.

...Observations were made in off-shore winds at heights of 0.5-8 m above sea on a large floating platform 800 m east of a N-S coastline in E. Britain, with air temperature at 1 m and sea temperature. With zero temperature gradient the observations were fitted by the logarithmic expression for aerodynamically rough flow, the roughness parameter increasing from 0.02 at 5m/s to 0.25 at 9m/s at 2m. With a temperature lapse the flow was less rough but not smooth. With inversion, wind speed increased with log (height) near surface but more rapidly at higher levels. Gustiness was measured at 1 and 2m and ratios of lateral and vertical gusts to mean speed calculated. Lateral gustiness was relatively great. --M.A.B. 6.3-157

70. Henning, Hurbert Pico-aerologische Untersuchungen über Temperatur- und Windverhältnisse der bodennahen Schicht bis 10m Höhe in Lindenberg. (Pico-aerological investigation on the temperature and wind conditions in the air layer near the ground up to a height of 10m at Lindenberg.) Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen, 6(42), 1957. 66p. 35 figs., 22 refs., 40 tables. DWB M(055) G373a V.6, No. 42 .

...A monograph in which the equipment and methods of measuring and recording temperature and wind on a microclimatic scale are critically reviewed on the basis of records obtained up to 75 m height for temperature and to 90 m height for wind at Lindenberg, but with emphasis on the lowest 10 m. Micrometeorological records made with automatic equipment, and extracted data, are presented in figures and tables throughout the work. Temperature measurements were made at 7 levels above the ground and 3 below the ground, with special resistance thermometers. Wind records were made with cup anemometers and with hot wire anemometers at 1 m above ground. Data analyzed are for April 1953-March 1954. Relationships between wind speed (and calms) and temperature gradients are brought out graphically and statistically as well as the frequency distributions of lapse rates, winds, etc. for the various seasons, hours of the day, heights above ground, and weather types. Two radiation types (clear and cloudy) for day and for night, and two inversion types

Source No. 70 continued

(calm and windy) are differentiated, discussed and illustrated in the analysis.--M.A.B. 9.4-11

71. Humphrey, Paul A. Brief discussion of the meteorological program at the National Reactor Testing Station, Idaho, with emphasis on the atmospheric dust program currently in progress. Sanitary Engineering Conference, Chicago, 1952, Proceedings. pub. 1952. p.143-154. 5 figs. DWB 628.5 S227s.

...The exact location of the NRTS in relation to surrounding terrain (in N.E. Idaho) is shown in a relief map of Idaho and several photographs of the desert region with sampling and micrometeorological equipment in operation. The test area which lies on the Snake River Plain is 34 miles long and 29 miles wide, and nearly flat and lies at 5000 feet elevation, with 9000 feet peaks at 10-40 miles distant. Meteorological program includes collecting temperature and precipitation extreme data, upper air winds and micrometeorological data to calculate general concentration of effluents in vicinity of stacks. Network of stations consists of Central Weather Bureau Office and 4 or 5 subsidiary stations, around periphery of area. Radio communications tower, 250 feet high, was used for the installation of electrical resistance elements for the continuous recording of the temperature lapse rate.--JAW

72. Ito, N., Okawa, T. and Kobayashi, T. On the turbulence and the termal equilibrium in the atmosphere near the ground surface. Journal of Meteorological Research, Tokyo, 5(10/12):764-773, January 1954. 11 figs., eqs., 10 refs., 3 tables. In Japanese; English summary p. 764. DWB M(05) J86mr V.5, No. 10/12.

...The authors observed temperatures and wind velocities from the ground surface to the height of 45 meters, and other thermal factors on the surface. From these data the eddy diffusivities were calculated by means of two independent methods, dynamical and termodynamical. The result of the former is in good agreement with that of the latter in the daytime, but not at night. It seems that the stability of the atmosphere has a great influence upon the eddy diffusivity. From all the observed factors it is found that the energy of the solar radiation which arrives at the ground surface is allotted as the following: 15 to 18% is reflected to the sky, 25 to 30% conducts into the ground, 30 to 35% is spent on the evaporation, and the Retsuretsupu conducts into the the atmosphere.--Authors' abstract

Observations were made on a radio tower at Retseuetsupu, Hokkaido, at the surface, 10 meters, 23 meters, and 45 meters height.--JAW

73. Jehn, K. H. and Gerhardt, J. R. A preliminary study of the eddy transfer of heat near the earth's surface. American Meteorological Society, Journal of Meteorology, 7(5):343-346, October 1950. 5 eqs., 5 figs., 5 refs. DWB M()5) A512j V.7.

Source No. 73 continued

...Results of studies made at the Manor Micrometeorological Field Station in Texas on August 3 and 4, 1948 compared with data obtained in southern Arizona and at Leafield, England, on the time and height distribution of eddy conductivity as calculated from the temperature, moisture and wind from the ground up to 300 feet. The equation of eddy heat transfer is developed, the heat transfer at the soil surface discussed and finally, the diurnal variation of K_H calculated for several levels.--JAW

74. Johns Hopkins Univ. Laboratory of Climatology, Summary of observations made at O'Neill, Nebraska, July 29 to Sept. 8, 1953. Contract AF 19 (604)-289, Scientific Report, No. 5. p. 151-238, 1953. mostly tables, graphs. Its Publications in Climatology, 6(5), 1953.DWB M8 J65p. V.6, No. 5.

...A careful compilation of temperature (air and soil), vapor pressure, wind, solar radiation, radiation balance, shearing stress and smoke puff (turbulent exchange) data for the micrometeorological layer obtained during Aug. and Sept. 1953 during the elaborate field program sponsored by the U.S.A.F. Geophysics Research Center and cooperating institutions near O'Neill, Nebraska. Details of instrumentation are given in text, and profiles of temperature, vapor pressure and wind in graphic form.--M.A.B. 6.2-46

75. Johns Hopkins University, Laboratory of Climatology The relationship between wind structure and turbulence near the ground. Publications in Climatology, 4(3), June 1951. Supplement to Interim Report No. 14, Micrometeorology of the Surface Layer of the Atmosphere, April 1, 1951 to June 30, 1951. 48+p. append., biblio. p.46-48, eqs., 20 figs., 11 tables. DWB M8 J65p V.4, No. 3.

...It is assumed that not only the exchange coefficient varies linearly with height, but also the shearing stress, a statement which was criticized in the subsequent discussion. The final integral for the velocity contains 4 constants so that it can easily describe varying observed wind profiles, making the author believe that experimental evidence of the basic assumption is provided. Furthermore, a linear variation of heat and moisture flux with height (!) is assumed. The solutions do not contain the roughness parameter and the universal turbulence constant usually found in other formulas. An extrapolation of Halstead's formula to greater heights roughly agrees with Hellmann's observations giving a minimum of wind velocity during noon.--M.A.B. 5.8-163

76. Konstantinov, A. R., Vertikal'nye skorosti vetra v atmosfere i metody ikh izmerenii. (Vertical wind velocity in the atmosphere and methods of measurement.) U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, Informatsionnyĭ Shornik, 1:91-97, 1951. 4 figs., 10 refs. DLC.

Source No. 76 continued

...A short review of methods and instruments used for measurement of vertical wind velocity. These methods can be classified into two classes: 1) the use of pilot balloons, kites, aeroplanes, gliders and smoke generators, and 2) the use of special mechanical manometrical, electrical instruments. The latter give more accurate results. During 1947-1948 the author constructed in the Central Geophysical Observatory three different types of apparatus for measuring vertical wind velocity. The first type is a modification of the usual anemometer; the second instrument is a modification of Wild's wind vane. The third model, the so-called hot wire anemometer, is based on the principle of definite loss of heat by the wire placed in an air flow. The temperature of the wire is measured by a thermocouple.--M.A.B. 4.1-157

77. Lander, A. J. and Robinson, George David Some observations of the small scale fluctuations of wind and temperature near the ground. Great Britain. Meteorological Research Committee. M.R.P. 740, Aug. 28, 1952. 15 p. 9 figs., 3 tables, 19 refs., eqs. Mimeographed. DWB M(055) G786m No.740.

...Records were made on cloudless days, wind 1-2 m/sec. 25 cm over short grass, with small vertical and horizontal hot wire anemometers and a resistance thermometer. Half hourly profiles were taken of air and earth temperature, humidity and wind, with solar radiation and fluxes of atmospheric and terrestrial radiation. Theory and errors of flux of heat and linear momentum are discussed, and the estimated fluxes, eddy conductivity and eddy viscosity tabulated. The heat flux found is 30-50% of that calculated from radiation and soil temperatures; the remainder is attributed to movements small compared with the instrument. The frequency distributions of the fluctuations are not normal and much of the heat flux is associated with large vertical currents. The turbulence is shown to be anisotropic.--M.A.B. 4B-337

78. Lappe, U. O.; Davidson, B. and Notess, C. B. Analysis of atmospheric turbulence spectra obtained from concurrent airplane and tower measurements. Presented at the IAS Meeting, N. Y. City, Jan. 1959. Institute of the Aeronautical Sciences, IAS Report 59-44, 1959. 21 figs., 2 tables, 11 refs., 8 eqs. DWB 629.1308 I59re.

The results of several research programs aimed at providing a better understanding of turbulence behavior at low altitude are summarized. Two techniques used for measuring gust velocity components from instrumentation mounted (1) in an airplane and (2) on a tower, are described briefly. Power spectral density estimates of the orthogonal turbulence components obtained from concurrent tower and airplane measurements are compared to test the hypothesis of G. I. Taylor that turbulence measured at a fixed point as a function of time can be simply related to turbulence measured at a fixed point as a function of time can be simply related to turbulence encountered along a path in space. The fixed point tower records analyzed in this experiment covered periods of about

Source No. 78 continued

one hour and mean wind speeds of about 20 mph; the flight records represented a 2 min sample covering a spatial path of about 10 mi. The results of these comparisons are discussed and some effects of altitude, mean wind speed, and terrain upon the intensity and shape of the spectral curves are shown.--Authors' abstract

79. Leavitt, J. M., Pooler, Jr., F. and Wanta, R. C. Design and interim meteorological evaluation of a community network for meteorological and air quality measurements. Air Pollution Control Association, Proceedings, Vol. 50, 1957. Paper No. 31 6 p. 5 figs. DWB M10.42 A298ap V. 50.

...An air quality and meteorological measuring network was designed to serve particular needs in the study of air pollution in the city of Louisville, Kentucky. Preliminary results indicate that the network data do qualitatively describe the air flow and air quality patterns. This qualitative understanding was necessarily preliminary to more qualitative description.--Author's summary

80. Lettau, Heinz A re-examination of the "Leipzig Wind Profile" considering some relations between wind and turbulence in the frictional layer. Tellus, 2(2):125-129, May 1950. figs., 3 tables, 5 refs., 20 equations. DWB M(05) T277 V.2, No. 2.

...P. Mildner (1932) calculated the vertical wind profile and austausch distribution for the frictional layer ($Z \leq 1000$ m.) from the average results of 28 balloon runs made near Leipzig between 0915 and 1615h. on Oct. 20, 1931. By obtaining the deviation of the azimuth of the geostrophic wind from the weather map, the calculated austausch was too large below 300 m. and too small above 300 m. In the present article Lettau has made a more accurate determination of the deviation of the geostrophic wind from the "Leipzig Profile" and using the average austausch distribution obtained by three different formulas, arrived at the conclusion that: "the energy for maintaining turbulence in a steady frictional wind profile is taken from the potential energy of the horizontal pressure field by means of the steady flow of air across the isobars." Computations by the three methods are tabulated, averaged and the standard deviation shown.--M.A.B. 1.11-58

81. Lettau, H. H. and Davidson, Ben (eds.) Exploring the atmosphere's first mile. (Project Great Plains). Volume I: Instrumentation and data evaluation. Volume II: Site description and data tabulation. Published by the Symposium Division, Pergamon Press, New York, London, Paris, 1957. figs., refs., tables. DWB M51 U58lex 2 Vols.

...The Great Plains Turbulence Field Program was a series of elaborate meteorological experiments performed in open prairie country near O'Neill, Nebraska, between 1 August and 10 September 1953. The project was conceived and organized by the Geophysics Research Directorate with the primary objective to study the profiles of wind, temperature, and other

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meteorological quantities in the lower 2000 m (atmospheric boundary layer); the turbulence structure, boundary fluxes of energy, momentum, and moisture; and the physical soil properties affected by diurnal variations of meteorological elements. In order to simulate as nearly as possible the reliability, accuracy, and reproducibility of boundary layer experiments in the wind tunnel, a site over flat and uniform terrain was carefully chosen and round-the-clock observations were made under defined conditions of large-scale weather pattern with clear sky. To obtain the maximum scientific return from the concurrent research in the field of micrometeorology, a great number of universities and US Government scientific organizations were invited to participate in the program. Volume I of this report contains an introductory article (history; summary of instrumentation and data collection phases; general conclusions) and 65 scientific papers which describe in detail the multitude of instrument types used at O'Neill. These articles are grouped according to synoptic material, soil physics, interface measurements, mast profile data, fluctuation quantities, and free air observations. The last chapter contains data evaluations concerning the heat budget constituents of the earth/air interface, classification of runs according to convective stability, and a non-dimentional analysis of atmospheric boundary layer structure. In Volume II are four articles (which describe the site, the climatology of the region, and the scheduling of observations), and detailed tabulations of experimental data which are organized according to the seven "General Observation Periods" with an average duration of 25 hours each.--Authors' explanatory note

82. Lettau, Heinz (G.R.D., Air Force Cambridge Res. Center, Cambridge, Mass.) The present position of selected turbulence problems in the atmospheric boundary layer. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 19:49-95, Dec. 1952. figs., tables, refs., eqs. DWB M(055) U589 No. 19.

...This work is essentially a development and modification of the author's theory published in 1949 (see item 7-37, July 1950, MAB). Relations developed previously in the literature are either special cases of the general theory or merely interpolation formulas. Pasquill's experimental data (see item K-173 and item 10-104, Nov. and Oct. 1950, MAB) on the distribution of meteorological elements up to 200 cm and the simultaneous heat budget of the earth's surface are used in order to verify successfully a modification of the laws governing an adiabatic atmosphere for superadiabatic and stable cases. A simple model of nonadiabatic surface layer turbulence with a separation of geometrical, dynamical and thermal factors is derived, which can be used by the practical forecaster. For this purpose the mixing velocity is studied. It is shown also that one parameter is sufficient to characterize the effects of thermal stratification, while the conventional Richardson number is a complicated function of height. One

Source No. 82 continued

of the supposed results is that the intensity of turbulence close to the ground increases from superadiabatic to neutral to inversional thermal stratification. Some measurements support this conclusion, while measurements at the conventional 200 cm height might contradict it. The lastter fact is explained by a changing height of the boundary layer itself. The density stratification in the superadiabatic surface layer is derived, giving a good agreement with results of F. A. Brooks (see item 5.1-3, Jan. 1954, MAB) for the layer of maximum density. Anomalous refraction of optical days and mirages in particular could be predicted from the theory.--M.A.B. 6.1-201

83. Longley, Richmond W. Eddy sizes as determined by the temperature fluctuations at O'Neill, Nebraska, August and September 1953. American Meteorological Society, Journal of Meteorology, 16:140-143, April 1959. eqs., 2 figs., 5 refs., 3 tables. DWB M(05) A512j V.16.

...Data obtained at O'Neill, Nebraska, during the summer of 1953, particularly data dealing with temperature fluctuations, have been examined to obtain information on eddy sizes. It was found that under conditions of lapse and slight inversion, the eddy sizes affecting any one level varied only slightly. Thus, on the assumption that the vertical temperature distribution was logarithmic, it was calculated that two thirds of the eddies affecting the 2-m level under these conditions lay between 0.5 m and 7.5 m in vertical extent. With increasing stability, the sizes decreased rapidly. Under all conditions of stability, the eddy size increased with height. Under inversion conditions, the increase was more rapid and, under lapse, less rapid than the logarithm of the height.--Author's abstract

84. McCormick, Robert A., The partition and intensity of eddy energy at the 91-metre level during unstable conditions as observed at Brookhaven National Laboratory. Royal Meteorological Society, Quarterly Journal, 80(345):359-368, July 1954. 8 figs., table, 17 refs. DWB--M(05) R888q V.80.

...Daytime measurements of three components of turbulence (time unit 10 sec) with accompanying temperature and wind gradients 125-11 m and wind speed at 91 m are analyzed. Total eddy energy (sum of squares of departures from 57 min means corrected for trend) is proportional to eddy supply but not related to vertical temperature and velocity gradients. Relations to energy supply are plotted separately for overland and oversea air, and for small (20 sec-2.5 min), medium (2.5-17 min) and large (17-57 or 114 min) eddies. Differences are not clear-cut but ratio of eddy conductivity to eddy viscosity is 3-6 times greater for overland than oversea air. Other properties analyzed are relation of cross-wind to vertical eddy energy, intensity of turbulence, Reynolds stress and eddy viscosity.--C.E.P.B.

85. McCormick, Robert A. The vertical flux of momentum by small eddies. Thesis (M.Sc.)-New York University, April 1951. 17p. 8 eqs., 2 figs., 9 refs., 4 tables. Typescript. DWB M58.1 M131v.

...Study is based on simultaneous observations of horizontal and vertical velocities made at 355 feet high level at Brookhaven National Laboratories by means of aerovane and bivane recording instruments. Eddies of periods >10 second and <1 hour duration were analyzed to determine relative contribution of three sizes of these eddies to the total momentum flux, for the purpose of aiding design of instruments for measuring Reynolds stresses. Conclusion is that the "middle size" or eight-minute class of eddies, with a vertical wave length of about 100 feet, was the most important in transport of momentum. These are presumably the eddies that are associated with cumulus cloud development.--JAW

86. MacCready, Paul B., Jr., Atmospheric turbulence measurements and analysis. California Institute of Technology, Contract Cwb-8290, (unnumbered report), Oct. 15, 1952. 26 p. 10 figs., eqs., 11 refs. DWB M51 C153a .

...Methods of measuring the velocity distribution, frequency spectra, autocorrelation coefficients and heat flux at a given elevation are described and illustrated. The measurements are made at elevations up to several hundred meters by use of a multi-cable tethering system for the instrument supporting balloon. Hot wire anemometers mounted on poles are used for frequencies from 0 to 50 cycles/sec and speeds of 0.25 to 20 m.p.s. The analysis is made from magnetic tape-recorder records. This equipment is described and illustrated, records reproduced and advantages cited.--M.A.B. 5.4-40

87. McLardie, M. D. Signal Missile Support Agency Missile Geophysics Research Tower U. S. Signal Missile Support Army Agency, Technical Memorandum, No. 588, January 1959. 23p. 14 figs., 12 refs., 4 tables. DWB M07.7 U582si No. 588.

...The report discusses the various studies and operational projects being supported by the Signal Missile Support Agency Research Tower, White Sands Missile Range operated by the Missile Geophysics Division. Certain limitations found in accepted methods employed at the tower, led to the development of new methods, and in some cases new instrumentation, with resultant greater accuracy and speed in collecting the data. Functions of the various instruments, and their locations on the tower are explained and illustrated.--Author's abstract

88. Maruyama, E. (Central Met. Obs., Tokyo) Relations between the vertical temperature difference and wind speed near the ground during daytime. Journal of Agricultural Meteorology, Tokyo, 7(3/4):117-118, Nov. 1952 fig., 2 tables, 4 refs. In Japanese; English summary p. 118 DWB M86:630 5678J V.7.

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...The author investigated the influence of wind speed at 1 m height upon the temperature difference between 10 cm and 150 cm height. There is evidence that the temperature difference is decreasing while wind speed is increasing. This relation is maintained during daytime in good weather conditions.--From author's abstract

89. Massachusetts Institute of Technology, Round Hill Field Station Measurements of the structure of turbulent flow at a height of 2.3 meters. Scientific Report, No. 1, August 1952, by H. E. Cramer and F. A. Record. Contract No. AF19(604)-145. eqs., 8 figs., 15 refs., 4 tables, 5 append.(tables). DWB M51 M414s No. 1.

...Simultaneous observations of air temperature, wind speed, and wind direction (both azimuth and elevation angles) were made at a height of 2.3 m in a large field. Measurements were obtained with three hot wire anemometers, three sensitive theremocouples, and one bivane; the time constants of these instruments range from about 0.1 to 0.5 sec. Six periods of observation during the afternoon and evening of 25 October 1951 have been analyzed; each sampling period was approximately 7 min in length and data were recorded by photographing two panels at the rate of one frame per second. Frequency distributions of the measured quantities are shown to be approximately Gaussian; the mean amplitude of the wind speed fluctuations is found to be proportional to the wind speed while the mean amplitude of the temperature fluctuations is proportional to the departure of the lapse rate from adiabatic. Correlations between temperature, wind speed, azimuth angle, and elevation angle are presented; the sign of the coefficients in most cases is correctly predicted by simple vertical displacement and a knowledge of the profiles of mean temperature and wind speed. Largest correlation is found between temperature and wind speed. Values are indicated for the transverse and longitudinal scales of turbulence for both temperature and wind speed; the transverse scale is in every case smaller than the longitudinal scale. The transverse scale of temperature appears to be smaller than that of wind speed while the longitudinal scales for both temperature and wind speed are of similar dimension. Eddy components of velocity are computed for each period of observation; the average value of the ratio $\overline{u'}$: $\overline{v'}$: $\overline{w'}$ is 1.0 : 0.63 : 0.43. The horizontal shearing stress varies from 0.2 - 5.0 g cm^{-1} sec^{-2}, with the lowest values occurring at night.--Authors' abstract

90. Massachusetts Institute of Technology, Round Hill Field Station Research on atmospheric turbulence and associated diffusion of aerosols and gases near the earth's surface. Final Report under Contract No. AF16(604)-145, June 1954, by H. E. Cramer, G. C. Gill and F. A. Record. eqs., 21 figs., 9 refs., 3 tables DWB M51 M414sf.

Source No. 90 continued

...This report consists of a study of the structure of atmospheric turbulence with particular emphasis upon the evaluation of the intensities and scales of the fluctuations, and actual measurements of diffusion from continuous point sources. The results of a series of determinations of the variance spectra of the eddy velocity components in the layer from 2-12 meters are discussed;"the frequency interval investigated ranges from about 0.5-0.005 cycle sec^{-1}." A discussion of the modification of the basic instrumentation for measuring fluctuations in wind speed and air temperature as well as of the instruments required for measuring time-mean values of these quantities is included. Illustration, diagrams and graphs of the response characteristics of the instruments are included.--JAW

91. Massachusetts Institute of Technology Research on turbulence and diffusion of particular matter in the lower layers of the atmosphere. Contract AF 28(099)-7, Progress Reports Nos. 1-11, February 10, 1949-August 10, 1951. 11 pieces. eqs., figs., refs., tables. Final Report, November 30, 1951. 80p. eqs., figs., refs., tables. DWB M51 M4144 Nos. 1-11.

...Progress reports numbers 1-11 include descriptions of the development and use of new instruments(gustometer, smoke densometer) and details of progress in various subprojects. Considerable data are tabulated in reports numbers 8-11. The final report is a sizable summary of research accomplished during the project including a statement of research and methods employed and lengthy reviews of the following five topics: 1) General instrumentation; 2) The structure of turbulent flow; 3) Turbulent flow and diffusion near the earth's surface; 4) The development of instrumentation for the determination of eddy coefficients; and 5) Symposium on atmospheric turbulence in the boundary layer.--JAW

92. Massachusetts Institute of Technology, Round Hill Field Station The variation with height of the vertical flux of heat and momentum. Scientific Report, No. 3, by Harrison E. Cramer and Frank A. Record. Contract No. AF19(604)-145. October 1953. 8p. eqs., 4 figs., 19 refs., 6 tables. DWB M51 M414s No. 3.

...Direct measurements have been made of the vertical flux of heat and momentum in the layer from 2 to 12 meters. Eddy velocities were obtained from hot-wire anemometers and light bivanes, mounted at four levels; temperature fluctuations were measured with fast-response thermocouples, mounted at three levels. Data were recorded by taking photographs of indicating dials, at the rate of one exposure per second. Six sets of data have been analyzed, each set corresponding to one period of observation approximately 10 sets of data have been analyzed, each set corresponding to one period of observation approximately 10 minutes in length. In four sets of data, the flow was over a rough land surface; in one set, the flow came directly from a water (ocean)

Source No. 92 continued

surface; in the remaining set, the flow was principally over water except for a short land trajectory immediately upwind from the point of observation. The flux data show a maximum variation from two- to four-fold within the layer. Over land, the shearing stress tends to decrease with height during the day and to increase with height at night; over water, both the heat flux and the momentum flux tend to decrease with height and also are significantly smaller at all levels than over a land surface. Values are presented for the coefficients of eddy viscosity K_m, eddy conductivity K_h, surface drag C_d' and for von Kármán's constant k. For a land surface, the eddy coefficients are approximately equal near the ground; K_m increases with height at a slower rate than K_h at all levels. The values for C_d are in good agreement with previous estimates, based on less direct measurements. the rather complicated variation of k with stability and height is discussed; the average of all determinations is approximately 0.4. --Authors' abstract

93. Mather, John R. and Thornthwaite, Charles W. Microclimatic investigations at Point Barrow, Alaska, 1956. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, 9(1), 1956. 51p eqs., figs., tables. DWB M8 D777p V. 9, No. 1.

...A comprehensive program of microclimatic observations was carried out at several sites at or near Point Barrow, Alaska during the summer of 1956 under the direction of C. W. Thornthwaite, and the Drexel Institute Lab. of Climatology. Instruments (evapotranspirometers, radiation, wind profile, air and soil temperature and dew point) were developed for the rigorous Arctic conditions. Sites are described and shown on a detailed map, instruments of all types described and illustrated, the observational program outlined, and a substantial analysis of the heat and moisture balance and an evaluation of the results plus outline of the next year's program included. The basic data obtained every 2 hours during the significant periods are presented in tables.--M.A.B. 10.3-20

94. Mather, John R. and Thornthwaite, Charles W. Microclimatic investigations at Point Barrow, Alaska, 1957-1858. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, 11(2), 1958. 239p. 6 figs., 4 refs., numerous tables. DWB M8 D777p V. 11, No. 2.

...Continuous field observations of the heat and moisture balance made from June 1957 through Aug. 1958 at Point Barrow, Alaska, are analyzed and summarized in this monograph. Preliminary testing of equipment during the summer of 1956 was discussed in a previous report (10.3-20, March 1959, MAB). Instrumentation, site, general weather conditions, observational program, and an analysis of the observations with respect to: (a) heat and moisture budgets; (b) daily heat balance; (c) precipitation and (d) evapotranspiration are covered in text and

Source No. 94 continued

illustrated by charts, tables, graphs, profiles, etc. About 140 pages of appended tabular data give the actual 24-hourly observations on days when completed series of observations were made, thrice daily observations on other days during the period, and the heat budget computations. Elements covered include soil, heat flux, solar radiation, net radiation, vapor pressure, wind direction and speed, and air and soil temperature.--M.A.B. 10J-112

95. New York University AEC-air pollution project, meteorological phase. Annual Progress Report, June 1951 by H. A. Panofsky and I. A. Singer. Contract No. AF(30-1)-965. 67p. eqs., 6 figs., 35 refs., 7 tables. DWB M10.42 N532a 1951.

...Describes some meteorological investigations which were carried out for the purpose of gaining a better understanding of characteristics of atmospheric turbulence, especially those characteristics which can be reproduced in a wind tunnel. Four general topics were studied: 1) Eddy heat and momentum exchange coefficients were obtained by various methods and compared with each other. 2) A crude spectral analysis was made of the stress and kinetic energy, and was compared with a working hypothesis for the characteristics of the vertical velocity spectrum. 3) The factors governing radical changes of the characteristics of turbulence were investigated by observation and theory. 4) The variation of wind with height in the lowest 400 feet was analyzed statistically.--JAW

96. Obukhov, A. M. and Iaglom, A. M. (both, Inst. for Physics of the Atmosphere, Moscow) On the microstructure of atmospheric turbulence: a review of recent work in the U.S.S.R. Royal Meteorological Society, Quarterly Journal, 85(364):81-90, April 1959. 5 figs., 27 refs., 18 eqs. DWB M(05) R888q V.85.

...Owing to turbulence, the instantaneous distribution of wind velocity, temperature, humidity and other meteorological elements is of a very complicated character, the elements at different points undergoing random and often very considerable fluctuations. Similarly, the values of the same elements at a fixed point and at different moments are characterized by random fluctuations having a very wide spectrum. Space and time fluctuations of meteorological elements are of general geophysical interest since they characterize atmospheric turbulence which is one of the most important features of atmospheric motion. Moreover the study of fluctuations has an applied significance as one needs to know the statistical characteristics of fluctuations of meteorological elements are of general geophysical interest since they characterize atmospheric turbulence which is one of the most important features of atmospheric motion. Moreover, the study of fluctuations has an applied significance as one needs to know the statistical characteristics of fluctuations for the determination of the rate of the turbulent exchange in the surface layer, for the theory of meteorological instruments and for a number of problems of atmospheric optics,

Source No. 96 continued

atmospheric acoustics and radiometeorology. Because of their wide spectrum (both in space and time) the methods of study of these fluctuations vary according to the particular part of the spectrum which we are interested in. Here we shall mainly deal with the problem of small-scale turbulence (of the microinhomogeneities of the atmospheric fields) which are characterized by periods of a few hundredths of a second to some seconds and space scales of a few decimetres to some metres. Our consideration will mostly refer to the surface layer which has been studied most. In the U.S.S.R. a number of theoretical and experimental investigations concerning the microstructure of the principal meteorological fields, mainly those of wind velocity and temperature, have recently been carried out. The results of these investigations are in satisfactory agreement. Simultaneously some special problems of the physics of the atmosphere using the above-mentioned results have been treated. A brief review of all the investigations is given.--Authors' abstract

97. Pagon, W. Watters and others Discussion of variation of wind velocity and gusts with height (by R. H. Sherlock). American Society of Civil Engineers, N. Y., Proceedings, v. 79, separate No. D-126, March 1953. 20 p. 14 figs., 4 tables, eqs. DWB P Collection .

...Pagon points out, that the use of one-sixth power law fits Sherlock's test data well, but that over large areas of water a more rapid increase of velocity with height at low elevations occurs "so that the gradient wind is approached more rapidly at low elevations than is indicated by the sixth power law thus producing greater pressures on high buildings and bridges." Irving A. Singer and Maynard E. Smith criticize the work as being based largely on data obtained at only one location and they compare studies carried out at the Brookhave National Laboratory with Sherlock's work. Percy H. Thomas and M. H. Fresen comment on the variation of wind velocity with height on peak gust wind velocities and the effects of wind velocity and gustiness upon wind power. Robert A. McCormick comments on the validity of any empirical relationship that describes the structure of low level wind in one storm example. The various objections and criticisms are taken up by R. H. Sherlock. --M.A.B. 6.5-182

98. Panofsky, Hans A. and Crutcher, Harold L. Horizontal momentum flux due to small-scale turbulence. Journal of Meteorology, 8(6):420-421, Dec. 1951. 2 figs., 3 refs. DWB M(05) A512, V.8, No. 6.

Deviations of 10-sec average N and E components at a height of 109 m at Brookhaven, New York, from trend smoothed over an hour, were horizontally isotropic and gave values of meridional flux of zonal momentum negligible compared with large scale flux.--M.A.B. 4B-279

99. Panofsky, Hans A. and McCormick, Robert A. Properties of spectra of atmospheric turbulence at 100 metres. Royal Meteorological Society, Quarterly Journal, 80(346): 546-564, October 1954. eqs., 17 figs., 15 refs., 4 tables. DWB M(05) R888q V.80.

...The properties of spectra of vertical and horizontal turbulence and of their cross-spectra, at elevations near 100 m, are summarized; a few spectra from lower levels are considered. The following tentative conclusions are drawn: 1. At frequencies of the order of 100 c/hr and above, the spectral intensity is proportional to the square of the mean wind speed and essentially independent of the radiation intensity. At lower frequencies, the ratio of spectral intensity to the square of the wind speed increases with increasing incoming radiation. 2. The intensity-ratio of the co-spectrum of vertical and horizontal velocity to the spectrum of vertical velocity increases with increasing wind shear. It also decreases with increasing frequency, n, approximately as n^{-1}. 3. At low frequencies, the spectral intensity of the horizontal velocity components is generally much larger than that of the vertical velocity. At high frequencies, the spectral intensities of all velocity components are of the same order of magnitude. At low frequencies, the ratio of vertical to horizontal spectral density increases with increasing radiation. 4. The quadrature spectra at a given frequency tend to be negative with large radiation, positive with little radiation. This indicates that eddies are low and wide with little radiation, and tall with much radiation. 5. The frequency at the maximum of the vertical velocity spectrum decreases with increasing height and increasing radiation intensity. 6. The ratio of turbulent to mean energy is somewhat larger for air with over-land trajectories than for air with oceanic trajectories.--Authors' abstract

100. Panofsky, H. A. and van der Hoven, I. Spectra and cross-spectra of velocity components in the mesometeorological range. Royal Meteorological Society, Quarterly Journal, 81(350:603-606, Oct. 1955. 2 figs., table, 8 refs. DWB M(05) R888q V.81.

...Records at 91 m on the Brookhave tower are analyzed. Micrometeorological spectra (5 sec-3min) under high and low radiation show the tendency of heat convection to produce energy at lower frequencies (k cycles/km) than mechanical turbulence, and for a decrease of energy near k=0.1 (10 km or about 1 hr). Mesometeorological spectra (5 min-hourly) show a sharp increase for k below 0.1. The minimum at 0.1 is attributed to a gap between convection or mechanical turbulence and motion on a cyclonic scale or diurnal variations.--M.A.B. 7.3-197

101. Panofsky, Hans A. Statistical properites of the vertical flux and kinetic energy at 100 meters. Pennsylvania. State College. Mineral Industries Experiment Station, Contract AF 19(604)-166, Scientific Report No. 2, July 1, 1953. 78 p. 20 figs., 9 tables, 12 refs., eqs. DWB M51 P415r.

Source No. 101 continued

...Micrometeorological observations on the 410 ft Brookhaven (Upton) N. Y. meteorological tower on 22 occasions between Oct. 4, 1950 and Jan. 15, 1953 are analyzed and tabulated to show: 1) the frequency with which measurements should be made, and 2) the length of period over which observations should be carried out in order to appropriately determine the vertical flux and kinetic energy at 100 m. In order to do this, it was necessary to define turbulence and describe the structures of turbulence and the relations between flux, energy and bulk variables, and to estimate the flux of one element from the measured flux of another by using exchange coefficients. It is shown that mean wind speed, energy stress, and heat flux are all positively correlated. Also eddies between 2-1/2 min and 17 min produce most of the stress and heat flux. Effect of stability and wind direction is also shown. Conclusion is that observations at 10 second intervals are close enough to estimate Reynolds stress at 100 m on a sunny day. On windy overcast days every 3-1/2 sec, and at night much more frequently. For high frequency energy calculations 20% is omitted if observations are 5 or 10 sec apart. For kinetic energy estimates one hour is a long enough period but for heat and momentum flux a longer period, or better, several stations, are needed.--M.A.B. 5.9-185

102. Panofsky, H. A.; Cramer, H. E. and Rao, V. R. K. (all, Pennsylvania State Univ.) The relation between Eulerian time and space spectra. Royal Meteorological Society, Quarterly Journal, London, 84(361): 270-273, July 1958. fig., 3 tables, 11 refs. DWB M(05) R888q V.84.

... Simultaneous observations of space correlations and time correlations verify that Taylor's hypothesis x=Ut is valid for intervals up to at least 90 m, and for relative intensities of turbulence at least up to 0.26. It is also shown that, when the stratification is stable, the longitudinal scale of turbulence tends to be much larger along the flow than across it. In an unstable layer, the scale is of the same order of magnitude in all directions.--Authors' abstract

103. Panofsky, Hans A. The variation of the turbulence spectrum with height under superadiabatic conditions. Royal Meteorological Society, Quarterly Journal, 79(33):150-153, January 1953. 6 eqs., ref., 3 tables. DWB M(05) R888q V. 79.

...Measurements of turbulent variations of kinetic energy, Reynolds stress and heat flux at 75 and 300 feet on tower of Brookhave National Laboratory on August 31, 1951, are analyzed for small, medium and large eddies. It is confirmed that large eddies become increasingly important with height.--JAW

104. Panofsky, H. A. The vertical momentum flux at Brookhaven at 109 meters. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 19:219-230, December 1952. eqs., fig., 9 refs., tables. DWB M(055) U58g No. 19.

...A spectral analysis of vertical kinetic energy and stress under superadiabatic conditions, made on the basis of measurements at the Brookhave National Laboratory with slow response instruments. A working hypothesis is set up, explaining why the maximum contribution to the kinetic energy occurs at much lower periods than the maximum contribution to the stress.--JAW

105. Pennsylvania. State University, Mineral Industries Experimental Station, Department of Meteorology Structure of atmospheric turbulence close to the surface over smooth terrain. Final Report of Contract No. AF19(604)-2252, October 1958, by Hans A. Panofsky and V. R. K. Rao. 65 p. eqs., 21 figs., 13 refs., 5 tables DWB M51 P415re Final.

...This report summarizes a number of applications of diffusion and fine-structure data obtained in connection with Project Prairie Grass. There were three kinds of measurements carried out at O'Neill, Nebraska. 1) Measurement of concentration of SO_2 on five arcs at distances of 50, 100, 200, 400 and 800 meters from the source, as well as along six towers 100 meters from the source. 2) Fast-response measurements of horizontal and vertical directions of the wind, and of the wind speed, at five positions along a line. 3) Vertical profiles of the mean wind, temperature and moisture. This report contains sections on the following topics: 1) The characteristics of the lateral Lagrangian correlation. 2) Relation between Eulerian time and space correlations. 3) Lagrangian aspects of vertical motion. 4) Relation of concentrations to variances of effluent. 5) Relation of lateral and vertical dispersion to easily-measured parameters. 6) Inferring wind speed from turbulence measurements. and 7) Test of formules for estimation of prediction of spectra. Tables present the following data: powers of wind speed contributing to standard deviation of effluent; estimates of lateral dispersion; estimates of central concentration at 100 and 800 meters; comparison of methods for estimates of drift and drifts from spectra analysis.--JAW

106. Pennsylvania. State University, Mineral Industries Experiment Station. Department of Meteorology Structure of small scale and middle scale turbulence at Brookhaven. Scientific Report No. 1, March 1956, by H. A. Panofsky and Isaac Van der Hoven. Contract No. AF19(604)-1027. 77p. eqs., 34 figs., 10 refs., 7 tables. DWB M51 P415st No. 1.

...This report summarizes the result of experiments at the Brookhaven tower made in 1953-55. Its bulk deals with the properties of spectra and cross spectra of the velocity components, as obtained from tower, balloon and airplane observations. The following conclusions are drawn

Source No. 106 continued

tentatively: The spectrum of vertical motion shifts toward lower frequencies with increasing height, as previously reported. This shift is brought about by a greater importance of convective relative to mechanical turbulence at the greater heights. On the other hand, the spectra of horizontal winds shift little with height, at least in the micrometeorological region. The -5/3 law appears to be confirmed for spectra of horizontal wind components at high frequencies. Observations at Brookhaven as well as at University Park, Pennsylvania, suggest a gap in the spectrum of horizontal velocity components near periods of slightly less than an hour. The ratio of cospectrum u-w, to spectrum of vertical velocity is well determined at all levels by the same function of the ratio of wind shear to frequency. The variation of quadrature spectra with height confirms the interpretation of these quantities given previously.--Authors' abstract

107. Pennsylvania. State University, Mineral Industries Experiment Station. Department of Meteorology Structure of turbulence at O'Neill, Nebraska, and its relation to the structure at Brookhaven. Scientific Report No. 2, January 1957, by Raymond J. Deland and Hans A. Panofsky. Contract No. AF19(604)-1027. 44p. eqs., 43 figs., 7 refs., table DWB M51 P415st No. 2.

...The present report is based principally on the measurements of fluctuations of wind components at O'Neill, Nebraska, made during five 12-minute periods at four levels. Due to the small sample, the conclusions described here must be regarded as tentative. The report also makes use of eight sets of observations made at the Brookhaven National Laboratory, which are used for comparison. The most important conclusions are summarized as follows: 1. Large convective eddies show little preference as to direction. Large mechanical eddies tend to be oriented in vertical planes parallel to the wind direction. The difference is most pronounced over smooth ground. As a result, fluctuations of the lateral velocity components are relatively independent of wind speed, but are sensitive to changes in stability. 2. Convection produces turbulence with periods of the order of minutes, mechanical energy periods less than a minute. Since vertical velocities near the ground are produced mostly at high frequencies, convection has little effect on vertical velocity fluctuations close to the ground. 3. With decreasing wave length, turbulence of all kinds becomes more nearly isotropic. 4. Under convective conditions there is little variation of total turbulent energies with height. Otherwise, turbulent energies tend to decrease with height. 5. Normalized vertical-velocity spectra tend to be constant with height if plotted as function of $fn\ z/V$, where n is the frequency, z the height above the ground, and v the mean wind speed. Further, this function

Source No. 107 continued

appears to be independent of ground roughness. 6. The spectra of the horizontal velocity components appear to vary little with height when plotted on a frequency scale, although, close to the ground, the lowest frequencies seem to be suppressed. The effect of increased roughness is to increase the contribution of high frequencies (relative to the low frequencies) to the horizontal turbulence in accordance with 2, above. 7. A change of roughness length from 0.9 cm to about 1 m increases the Reynolds stress by about 10, the vertical energy by 6, the longitudinal energy by 3 and the lateral energy by 2. The variable sensitivity to roughness is due to the variation in the relative contributions of mechanical and convective energy to the total. 8. The spectral estimates and the variances of the vertical and longitudinal velocity fluctuations increase with increasing wind speed approximately according to the second power.--Authors' abstract

108. Pennsylvania. State University, Mineral Industries Experiment Station, Department of Meteorology. Structure of turbulence at O'Neill, Nebraska, and its relation to the structure of Brookhaven National Laboratory, Upton, Long Island. Final Report, November 1957, by H. A. Panofsky and R. J. Deland. Contract No. AF19(604)-1027. 77 p. eqs., 32 figs., 15 refs., tables. DWB M51 P415st Final.

...This report summarizes the properties of the variances, covariances and cospectra at O'Neill, Nebraska and Brookhaven, Long Island, in relation to easily observed conditions, such as roughness, wind, radiation, lapse rate and height. The spectrum of lateral velocity components can be divided most clearly into low-frequency convective and high-frequency mechanical portions. The convective portion is almost entirely a function of lapse rate or short-wave radiation, with a tendency to increase with height. It is essentially independent of wind speed and ground roughness. The mechanical portion, on the other hand, is sensitive to ground roughness and independent of stability, and also tends to decrease with height. Since the convective part of the spectrum can be large at daytime, the total variance of lateral velocity shows a tremendous diurnal variation. The properties of the spectrum of the longitudinal wind component are similar as those of the lateral component. However, the low-frequency portion of the spectrum is considerable even in stable air, showing that the largest eddies at night are elongated along the wind. Further, the effect of ground roughness on the "mechanical" high-frequency portion of turbulence is not as great as that corresponding section of the lateral spectrum. The vertical spectrum in the lowest 30 feet or so is entirely controlled by the proximity of the ground. Low-frequency energy increases upward, high-frequency decreases. There is little separation between convection and mechanical turbulence; the effect of surface roughness is large over the whole spectrum, and the toral variance is sensitive to stability. Above 50 feet, the separation of mechanical and convective turbulence makes its appearance gradually until, at 300 ft., the low-frequency energy is largely controlled by radiation intensity;

Source No. 108 continued

the high-frequency energy by wind speed. A continued shift toward lower frequencies toward greater heights is therefore encountered only in unstable air. The cross spectrum between vertical and longitudinal wind components is extremely sensitive to roughness, wind shear, and is always negative. Cross spectra between other wind components are generally negligible. With only results available from two locations of widely differing ground roughness, an attempt is made to establish the effect of roughness on turbulence spectra quantitatively in order that estimates are possible for regions of intermediate roughness. Finally, the report attempts to describe eddy structure schematically. In one of its appendices, the report further contains a summary and explanation of procedures commonly used in numerical spectrum analysis.--Authors' abstract

109. Pennsylvania. State College, Mineral Industries Experiment Station, Division of Meteorology. The cooperative turbulence study of August 30-31, 1951 at the Brookhaven National Laboratory. Scientific Report No. 1, June 1952. Contract No. AF 19(604)-166. 49p. 15 eqs., 10 figs., 6 refs., 10 tables. DWB M51 P415s No.1.

...Two completely different sets of instruments and airplane soundings were used for measurements of surface stress, heat flux, turbulent kinetic energy, exchange coefficients, etc. Magnitudes obtained by different instruments may differ widely. Exchange coefficient for heat was nearly constant with height, the coefficient for momentum increased rapidly. Working hypothesis for turbulence spectrum discussed and improved in order to fit the observations and to agree with the Eisenberg-Kolmogorov theory for high frequencies.--JAW

110. Platt, Robert B. A field installation for automatic recording of micro-environmental gradients. American Geophysical Union, Transactions, 38(3):166-170, April 1957. 3 figs., 5 refs. DWB P Collection.

...A laboratory has been constructed in the field with a design sufficiently basic and flexible to permit correlation of micro-environmental conditions with distribution and abundance in space and time of a wide variety of plants and animals. Two 50-ft wooden towers, located at ecological extremes of a dense woodland and an open field, have been equipped with instruments for automatic recording of micro-environmental gradients. Aminco-Dunmore-type electric humidity and temperature indicators have been placed at the 0, 3, 6, 15 and 50 ft levels, and temperature elements only at the 1, 16, 18 and 36 inch soil depths, each complete set being fed into a 16-point strip recorder. Special weather shields have been designed for the humidity-temperature indicators. Recording anemometers are at the 3 and 50 ft levels, and recording rain and surface water level gages are near the base of each tower. Portable instruments provide for supplementary environmental data on radiation, light, wind, temperature and humidity.--Author's abstract

111. Poppendiek, Heinz F. Gustiness profiles in the lower layers of the atmosphere. Meteorological Monographs, Boston, 1(4):36-38, November 1951. 4 figs., 5 refs. DWB M(055) A512m V.1, No. 4.

...Two sets of experimental gustiness profiles in the lower layers of the atmosphere under a range of stability conditions are presented. One set was obtained in the lower 200 ft. over a desert in Arizona and the other set was obtained in the lower 2000 ft. over Los Angeles, California. These measurements were made with the aid of British bivanes and by observing diffusion rates of smoke plumes. Some interpretations of the diurnal variations of these gustiness profiles are given.--Author's abstract

112. Saha, K. R. (Indian Air Force Station, Ambala), Vertical diffusion of horizontal momentum by turbulence in the lower atmosphere. Indian Journal of Meteorology and Geophysics, Delhi, 7(2):147-152, April 1956. 5 figs., 8 refs., 4 eqs. DWB M(05) I39; V.7, No. 2.

...The effect of stability on the variation of wind with height and examples of the diurnal variation of vertical wind structure in relation to lapse rate, the vertical diffusion of momentum and the onset of turbulence at the ground, and, finally, the importance of studies of momentum diffusion for aviation are discussed and illustrated graphically from data for Ambala Airport (supplemented by radiosonde data for Delhi, 120 mi south). It is shown that westerly momentum diffuses downward during the daytime, resulting in either (a) a complete shift of wind from easterly to westerly, or (b) an increase in westerly wind at the surface. In both cases turbulence increases markedly at the surface.--M.A.B. 8.3-79

113. Sakagame, Jiro (Dept. of Physics, Faculty of Science, Ochanomizu Univ.) On the structure of the atmospheric turbulence near the ground, (Pt.1). Tokyo. Ochanomizu Univ., Natural Science Report, 1:40-50, March 1951. 14 figs., 3 tables, refs. Pt. 2, Ibid., 2:52-71, Nov. 1951. 11 figs., 2 tables, 3 refs. Pt. 3. Ibid., 4(2):201-212, March 1954. 9 figs., 3 tables, 3 refs. DLC.

...The three reports give details of an original and extremely laborious project for the study of the fine structure of turbulence near the ground during a sea breeze. First horizontal and vertical eddies were charted by using hot wire anemometers and later by using rows of small paper-pin-wind vanes (10 rows set 5 cm apart and 12 vanes in a row 3 cm apart) 90 cm above the ground, photographed by a moving picture camera 20 times a second. The second report covers similar experiments using more sensitive vanes made of dandelion down attached to rayon fibres mounted on glass tubes on pins supported by nails (14 rows, 5 cm apart, 12 vanes to a row 3 cm apart and 17 cm above ground) photographed in both a horizontal and a vertical plane. Individual eddies are shown to be mostly vertical; to be carried down stream by the wind with a lifetime of about 1 second, and to maintain

Source No. 113 continued

about the same diameter as they increase and dissipate. The behaviour of the eddies, as they converge, was observed and charted. In the third report a 3-dimensional frame was made to support the dandelion down wind vanes and photographs were made from the side with stereo camera and the deflections plotted. It was found that the eddies leaned forward at about a 20° angle and were about 5 times as long as their diameters (Rankine eddies) and that they incline along and move with the main stream.--M.A.B. 8.4-223

114. Serra, Louis Le vent en France et ses possibilites d'utilisation. (The wind in France and possibilities of its utilization.) La Meteorologia, 4th Ser., No. 32:273-292, October/December, 1953. 14 figs., 2 plates. French, English and Spanish summaries p. 273. DWB M(05) M589v 1953.

...Since 1947 a network of experimental wind-energy stations has been set up in France, with wind indicators calibrated to give the energy received per swuare meter of surface rather than in speed (m/sec). The energy is proportional to the cube of the speed. The network is shown on a chart. The mountainous regions are neglected since the instruments would be subject to icing failure and furthermore there is enough hydroelectric power available there. Elsewhere the network is quite uniformly distributed. A graph shows the normal (1890-1909) values of monthly wind speed which will occur at the Eiffel Tower (or) 10%, 25%, 50%, 75% and 90% of the time. The stability of the monthly mean wind speed frequencies is represented by an index which varied greatly from one place to another and even more sharply when energy (v^3) is used as basis for index instead of speed (v).--M.A.B. 6.5-199

115. Shellard, H. C. Extreme wind speeds over Great Britain and N. Ireland. Great Britain. Meteorological Office. British Climatological Branch, Memoranda, No. 6, 1956. 5p. 3 figs., 3 tables. DWB M(055) G786br No. 6.

...Gumbel's theory is applied to highest mean annual speeds and highest gusts at Cardington 1932-1954, and gives return periods with sufficient accuracy. Analysis is the applied to values at 48 anemograph stations, reduced to 10 meters above the ground, and maps of hourly speeds and gusts likely to be exceeded once in 50 years are drawn.--JAW

116. Sherlock, R. H. Variation of wind velocity and gusts with height. American Society of Civil Engineers, Proceedings, Volume 78, Separate No. 126, April 1952. 7 eqs., 12 figs., 24 foot refs. DWB P Collection.

...Ekman's theory of wind velocity variation with height is reviewed. Ekman spirals, observed wind velocity (recorded during winter storm in 1933 on a 250 feet high steel tower) and computed gradient wind are compared graphically. It is found that the seventh-power law is

Source No. 116 continued

a sufficiently close approximation to the theoretical curve up to only 1000 or 1500 feet above which a constant velocity should be used. Gust factors important for structural design are described. Charts show micro-structure of wind in lowest 250 feet of the atmosphere.--JAW

117. Shotani, Masao Turbulence in the lowest layer of atmosphere, Sendai, Japan, Tohoku. Univ., Science Reports, 5th Ser. Geophysics, **2**(3):167-200, Dec. 1950. 32 figs., 14 tables, 38 refs., eqs. DWB P Collection.

...A study useful in practical investigations. Meteorological observations in the lower 15 m of the atmosphere are compared with the statistical theory of turbulence. The vertical distribution of temperature, measured by a resistance thermometer, is given. The fluctuations of wind velocity were measured by hot wire anemometers. A description of the instruments used is given and errors in the measurement of air temperature are examined. Calculations of the mean energy of turbulence and other turbulence characteristics are made by the Hesselberg method. In summer, the mixing length increases almost linearly with the height; in winter it maintains a constant value upwards of 5 m. Correlations needed in the theory are given, especially of the velocity flucutations with time and space with the fluctuations of temperature. The spectrum of turbulence is examined and vertical component of the wind velocity observed. The mean turbulence velocity seems to be directly proportional to the wind velocity. The material is extensive but not sufficient for drawing general conclusions.--M.G.A. 14.2-595

118. Singer, Irving A. and Raynor, Gilbert S. A study of the wind profile in the lowest 400 feet of the atmosphere. U. S. Brookhaven National Lab., Contract R-65-8-99812 SC-01-91, Progress Report No. 2, Jan. 15, 1958-Jan. 14, 1959, April 1959. 25 p. 27 figs., 3 tables, 8 refs., 10 eqs. DWB M(051) U582 pro No. 2.

...By using mean hourly wind speeds measured over a 2-yr period on the Brookhaven meteorology tower, values of p. the exponent of a power law expression for the wind profile, were computed for two height intervals (37-150 ft and 150-355 ft) and were related to a number of easily obtained meteorological parameters. It was found that the mean wind speed profile shows a systematic relationship to a number of other variables, and that several of these, such as wind speed, lapse rate, gustiness and time of day, are useful as predictors. The variation of p for shorter time intervals was studied in a number of typical cases. Theoretical mathematical models were developed to determine how the wind profile might best be described and to evaluate the wind profile in vector rather than scalar form.--Authors' abstract.

119. Singer, Irving A. and Raynor, Gilbert S. Analysis of meteorological tower data, April 1950-March 1952, Brookhaven National Laboratory. U. S. Atomic Energy Commission, (Report) BNL-T, 102, June 1957. 93p. 86 figs., forms. (ASTIA Document AD 133806. AFCRC-TR-57-220). DWB M84.2 S617an.

...Installation and surroundings at Brookhaven are described, origin and accuracy of data and analytical procedures discussed, and a detailed analysis of hourly temperatures, wind, wind and temperature data for six levels from a 420 feet high meteorological tower, and upper air data are presented. Appendices describe punch card data and IBM, Remington Rand and answer card decks. The local climate and topography are described, data and analysis procedures discussed, and the wind and temperature data correlated with geostropic winds, cloudiness, lapse rates and gutiness. Data are presented mainly in form of graphs, histograms and time cross-sections.--JAW

120. Singer, Irving A. and Smith, Maynard E. Relation of gustiness to other meteorological parameters. American Meteorological Society, Journal of Meteorology, 10:121-126, April 1953. eqs., 11 figs., 2 refs. DWB M(05) A512j V.10.

...Two years of data have been processed to show relationships between wind gustiness and other meteorological parameters. The gustiness classification used at Brookhaven National Laboratory is defined by the range and appearance of the horizontal wind direction trace. The seasonal and diurnal variations are presented. Gustiness is closely related to lapse rate and solar radiation, while its association with wind speed and Sutton's index of turbulence is not as distinct.--Authors' abstract

121. Singer, I. A.; Raynor, G. S. and Smith, M. E. Wind profile study. U. S. Brookhaven National Laboratory, Contract R-65-8-99812-Sc-01-91, Progress Report Jan. 15-Oct. 15, 1958. 7p. eqs. DWB M(051) U582pr.

...The objective of this study is to obtain a reliable estimate of the wind vector at all altitudes up to 400 ft above the ground, based on a single wind vector measurement at some low altitude, such as 37 ft. The authors also hoped to find associated meteorological measurements or observations which would serve as criteria in specifying the wind in this zone. A simple equation for the wind speed profile for two tower height intervals was related to standard meteorological observations from the existing Brookhave hourly tower data. Indications are that the average wind profile over a one hr period can be predicted by standard meteorological data, but the variance of the profile is large and more detailed data and further analysis is needed before a complete picture of the physical processes is obtained. To determine how the wind profile varies with the averaging time within a given meteorological condition, five 20-min wind records at five heights

Source No. 121 continued

were analyzed in great detail. This analysis has been used as background for theoretical models as it is the first indication of the variation of the wind profile with averaging time.--From authors' summary

122. Sinha, K. L. and Sharma, H. R. A study of winds exceeding 20 mph at Delhi. Indian Journal of Meteorology and Geophysics, 4(2):145-163, April 1953. 2 figs., 12 tables, 3 refs. DWB M(05) I39i V.4, No.2.

...The location of Safdarjung airport (28° 35'N; 71°12'E) whose wind records (1946-1950) are analyzed, is briefly described. Direction, velocity, duration and time-of-commencement frequencies are tabulated for winds exceeding 20 mph. The material is presented separately for winds (a) not associated with other weather phenomena, (b) associated with rain or thundery conditions and (c) associated with dust-storms or thunderstorms. Synoptic situations connected with strong winds are discussed. A brief comparison with winds at Allahabad is added.--M.A.B. 5.6-165

123. Stevens, Donald W. and Gerhardt, John R. A new meteorological research tower. American Meteorological Society, Bulletin, 40(1):24-26, January 1959. fig. DWB M(05) A512b V.40, No. 1.

...A tower located at Cedar Hill, Texas, owned jointly by WFAA-TV and KRLD-TV of Dallas has been chosen to serve as a platform for meteorological instrumentation capable of providing continuous observations at necessary heights of the low-level jet. Wind and temperature at various levels are planned. The possibilities of utilizing the same tower for investigating wind gustiness and turbulence in the lower atmosphere have also been considered.--JAW

124. Tank, William G. The use of large-scale parameters in lower level diffusion computations. American Meteorological Society, Bulletin, 38(1, Pt. 1):6-12, Jan. 1957. 7 figs., 2 tables, 4 refs., 17 eqs. DWB M(05) A512b V.38, No. 1. Also issued as U. S. Dugway Proving Ground. Cloud Physics Branch, Scientific Report, No. 4, March 6, 1956. 38 p. 3 figs., 9 foot-refs., 41 eqs. DWB.

...A method is set forth whereby gaseous diffusion in the low levels of the atmosphere can be calculated by Roberts' diffusion equation (modified to consider instantaneous volume sources) using only large scale synoptic parameters that are readily obtainable from the surface analysis and pibal reports. The three pertinent meteorological parameters utilized are: 1) the mean surface wind, 2) the angle between the surface wind vector and the surface isobars, 3) the height of the gradient level. Theoreteical and observed dosage values are compared by means of dosage isopleth diagrams. Results show that the method

Source No. 124 continued

yields quite satisfactory results, with regard to both dosage magnitude and distribution. The assumptions necessary for the application of the method, and their relative importance, are mentioned. The limitations of the method are also discussed.--Author's abstract

125. Taylor, R. J. The dissipation of kinetic energy in the lowest layers of the atmosphere. Royal Meteorological Society, Quarterly Journal, 78(336):179-185, April 1952. 3 tables, 9 refs. DWB M(05) R888q V.78.

...Author calculates the flux of kinetic energy into the top of a shallow layer of air bounded below by a uniform horizontal ground surface, using observations by Swinbank and Deacon (unpublished). Values of energy dissipation per unit mass are calculated for levels of 1-50 m and found to account for over 1/4 of the observed rise of temperature 2 to 1/2 m. The size of the eddies which give the greatest dissipation of energy is calculated from expressions by Richardson and G. I. Taylor giving lengths of 2-9 cm at 2 m height.--M.A.B. 4B-324

126. Tohsha, M. On the wind speed profiles in the lower atmosphere. Papers in Meteorology and Geophysics, 4(3/4):104-108, Dec. 1953. 6 figs., tables, 5 refs., eq. MH-BH.

...Mean hourly wind velocities measured on tower at 10, 90, 210 and 312 m height are given. A period of one week was utilized. The logarithmic law is followed in the midday but diring the night and in the morning a break occurs in the profile. The calculated roughness length is 0.6 to 2.0 m in the lower layer and around 17 m for the upper layer during the night with a rapid increase a ter sunrise.-- M.A.B. 8.8-252

127. Tolefson, H. B.; Pratt, K. G. and Thompson, J. D. An experimental study of the relation between airplane and wind-vane measurements of atmospheric turbulence. U. S. NACA, Research Memorandum, L52L29b, July 17, 1953. 20 p. 3 tables, 8 figs., ref. DWB 629.1308 U585rm.

...Simultaneous measurements of horizontal-velocity fluctuations derived from the motions of wind vanes mounted on a tower and vertical-velocity fluctuations derived from the vertical accelerations of an airplane flying in the immediate vicinity of the tower have been examined for relations between the horizontal gusts measured with the vanes and the vertical gusts measured with the airplane. The measurements were made at the Brookhaven National Laboratory in clear air and on generally windy days. The results indicate that good correlation is obtained between the horizontal gusts evaluated from the vane motions and the vertical gusts measured by the airplane provided that the gusts selected in both cases are of about the same wave length. It appears from the results that airplane measurements of turbulence can be interpreted in terms of surface measurements to extend the scope of data available to either the engineer or the meteorologist.--Authors' abstract

128. U. S. Weather Bureau, Meteorological survey of the Oak Ridge area. Final report covering the period 1948-1952. U. S. Atomic Energy Commission, ORO-99, Nov. 1953. 584 p. 181 figs., 56 tables, 107 refs. p. 25-32, eqs. DWB M84 U587 m.

...An enormous volume presenting accumulated data and analyses thereof, based on a survey of the meteorological and climatic conditions in the Oak Ridge, Tenn., District. The purpose and scope of the project, history, available records, etc. constitute Pt. I. Pt. II describes instrumental equipment and observational techniques--accuracy, representativeness, etc. Pt. III comprising more than 300 pages, gives the basic data in tables and many kinds of graphs, charts, etc., together with an analysis of each element: 1) pressure, 2) precipitation, 3) cloudiness, solar radiation, ceiling, visitility and state of ground, 4) temperature and humidity at ground, 5) vertical temperature gradient, 6) wind and turbulence. Pt. V gives results of atmospheric diffusion investigations. The studies of smoke trails, radioactivity traces and the effects of buildings, forests, ridges and mountain gaps are summarized. Theoretical approaches are set forth for each operation. Quantitative data is given in detail in tables and charts and equipment in illustrations. Sample records are also reproduced throughout. Four years of detailed data, such as microstructure of wind and temperature, solar radiation, etc. are supplemented by long period records (some 75 years) from nearby stations and upper air soundings of 15 years (radiosonde) to 30 years (pilot balloon) from stations in this general portion of the country.--M.A.B. - 5.5-9

129. Van der Hoven, Isaac Atmospheric turbulence characteristics at Brookhaven between 23 and 91 meters height. Thesis (Ph.D.)-Pennsylvania. State University, Department of Meteorology, January 1956. 96p. eqs., 23 figs., 33 refs. DWB M51 V217a.

...A doctoral dissertation based on a study whose aim is to determine the relation between turbulence characteristics and large scale parameters (stability, short wave radiation, orography, etc.). The data used were from August 1951 to May 1954 on the Brookhaven meteorological tower between 23 and 91 meters above the ground and comparative data from Round Hill. Uses of such information in numerical prediction, fallout prediction, design of aircraft, etc. are suggested. Previous research is reviewed, methods power spectrum analysis outlined and the properties of spectra analyzed with many graphical illustrations. Among the conclusions are: 1) a linear relationship exists between vertical eddy energy and the square of the mean wind speed for wave numbers > 4 cycles/km; 2) vertical eedy energy is dependent on the amount of short wave radiation only for the larger eddies (< 2 cycles/km) and 3) and increase in short wave radiation increases the vertical eddy energy.--JAW

130. Van der Hoven, Isaac Power spectrum of horizontal wind speed in the frequency range from 0.0007 to 900 cycles per hour. Journal of Meteorology, 14(2):160-164, April 1957. 7 figs., 2 tables, 11 refs. DWB M(05) A512j V.14, No. 2.

...Selected portions of horizontal wind speed data from 91,108 and 125 m on Brookhaven tower were analyzed. Two main maxima were found, at 10^{-1} and 50 cycles per hr (4 days and 1.2 min), attributed to migratory pressure systems and turbulence. A minor maximum exists at 10^{-1} cycle (12 hrs). A broad gap extends from 1 to 10 cycles; this "spectral gap" is found in other records also.--M.A.B. 8.8-249

131. Van der Hoven, Isaac and Panofsky, H. A. Statistical properties of the vertical flux and kinetic energy at 100 meters. Pennsylvania State University. Mineral Industries Experiment Station, Dept. of Meteorology, Contract AF 19(604)-166, Final Report, June 30, 1954 55 p. 54 figs., 9 tables, 15 refs., 20 eqs. Mimeo. DWB M51 P415sf.

...Using the 125 m meteorologic tower of the Brookhaven National Laboratory the authors made wind, temperature and radiation measurements at the 23 m, 46 m and 91 m levels in order to determine the specific distribution of turbulent energy and stress at these levels and the relations between energy and stress with mean wind speed, radiation lapse rate and height. The instrumentation, the method of crude spectral analysis and of exact analysis as recommended by Tukey are described in detail. The conclusion are as follows: "The importance of low frequencies and spectra and cross spectra of all kinds increase with increasing height and with decreasing stability. Spectral intensities are generally linear functions of the square of the wind speed. The ratio of cross spectrum to spectrum of vertical velocity at any frequency is well determined by the ratio of vertical wind shear and frequency. At least under stable conditions at 91 m and under all conditions at lower levels a gap in horizontal speed spectra is indicated at frequencies less than 20 cycles/hour. Quadrature spectra made possible an estimate of the vertical extent of the predominant eddies. The stress and energy of turbulence near 100 m, both vertical and three dimensional, can be estimated from the wind speed at a given level and short wave radiation intensity. Eddy viscosities at 100 m depend strongly on stability of the air. Stress and energy decrease with increasing height when the stratification is near-vertical.-- M.A.B. 6.7-225

132. Verle, E. K. Osobennosti godovogo khoda kharkterisik turbulentnosti nad Vladivostokom. (Peculiarities of annual variations of turbulence characteristics over Vladivostok.) Dal'nevostochnyi Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Trudy, No. 3:47-64, 1958. 6 figs., 10 tables, 14 refs., 6 eqs. DWB M(055) D148tr No. 3.

Source No. 132 continued

...The results of studies of the annual behavior of turbulence in the lower troposphere over Vladivostok are discussed. Richardson's number is taken as the basic characteristic for the computation of the turbulent state of the atmosphere. Simultaneously with data of mean monthly turbulence characteristics, data of their recurrence are taken into consideration. The highest turbulence in the lower atmosphere over Vladivostok was found in the spring and in the fall, while low turbulence predominates in summer and winter.--M.G.A. 13-2-384.

133. Wanta, R. G. The onset of turbulence in an elevated layer near sunrise. Royal Meteorological Society, Quarterly Journal, 79(341):398-402, July 1953. 2 figs., 14 refs. DWB M(05) R888q V.79.

...Wind direction records at 46 and 125 m, Brookhaven, N. Y., showing smooth flow, damped eddies and turbulent flow (eddy period less than 1 min) are illustrated. Occasions of smooth and turbulent flow are plotted against differences of temperature and wind speed across the layer, and calculated Richardson numbers drawn in. The critical values of the latter are found to lie probably between 1/3 and 1/2.--M.A.B. 4.11-181

134. Yoshino, M. Wind speed profiles of the lowest air layer under influences of micro-topography. Meteorological Society of Japan, Journal, Series 2, 36(5): 174-186, October 1958. 2 eqs., 11 figs., 15 refs., 9 tables. DWB M(05) M589sj V. 36.

...To make clear influences of micro-topography on the wind structure near the ground, the variation of wind speed with height up to 5 meter above the ground was observed at various stations situated on the flat open land, and on the side slopes or in the bottom of the small valley. Differences of the profiles from the so-called logarithmic law were evident. The types of the profiles were grouped roughly into three types according to their micro-topographic situation. When the prevailing wind flows at right angle to the running direction of the small valley having steep side slopes, maximum of wind speed at 2-3 meter above the ground appeared on the lower part of the valley slope or in the valley bottom, owing to the counter flow of the lower part of eddies formed in the valley. The counter flow had some twisted characters with the direction of mountain or valley wind and the ratio of its speed to that of the prevailing wind showed a relation to the prevailing wind speed and the time of day.--Author's abstract

1960 To Present

135. Ariel', N. Z. and Kliuchnikova, L. A. Veter v usloviiakh goroda. (Wind in cities.) Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy, No. 94:29-32, 1960. 4 figs., table, 2 refs. Russsian summary p. 29. DWB

Source No. 135 continued

M(055) U581tg No. 94. Translation into English by Irene A. Donehoo issued by U. S. Weather Bureau, May 1961. 6 p. 4 figs., etc. English summary p. 1. DWB M53. 6 A698wi.

...The characteristics of wind speed in Kiev and Leningrad were investigated on the basis of observation on wind velocity recorded on television masts at altitudes of 24, 48, 96, and 108 m in Kiev and at altitudes of 18, 34, 50, 68, 82, 98, 110 and 146 m in Leningrad. It is shown that a large roughness value for the underlying surface weakens the effect of stratification upon the magnitude of the wind speed in the lower layers and that the angle of deviation of the ground wind from the isobars increases over cities.--M.G.A. 15.11-346

136. Barad, Morton L. and Fuquay, James J. Diffusion in shear flow. American Meteorological Society, Journal of Applied Meteorology, 1(2):257-264, June 1962. eqs., 13 figs., 5 refs., 4 tables. DWB M(05) J86joa.

...In the Green Glow program conducted near Richland, Washington, during the summer of 1959, 26 diffusion experiments were conducted during nocturnal inversions. The tracer was released near ground level. Samplers were placed at 1.5 m above ground at 533 positions on six sampling arcs, the radii of which were 200 m, 800 m, 1.6 km, 3.2 km, 12.8 km, and 25.6 km. In addition to the ground sampling network, poles or towers were erected at five points, 8 deg apart, on each of the four inner arcs. Fifteen samplers were mounted on each pole or tower, the top level increasing from 27 m on the 200 m arc to 62 m on the 1.6 km and 3.2 km arcs. The vertical measurements of tracer dosage made during Experiment No. 3 suggest that during this experiment, conducted during one of the stronger inversions, the mean wind direction changed significantly with height in the lowest 200 ft. Direct measurements of mean wind direction confirm this notion. A diffusion model is discussed in which the tracer dosage at a point downwind from the source is given by the normal frequency function of two variables (the lateral and vertical coordinates of the point) and the correlation coefficient between the lateral and vertical coordinates of the tracer particles. Experiment No. 3 is examined in terms of this model and is found to satisfy well the major conditions of the model. In addition, the model and the empirical evidence suggest that care must be exercised in the interpretation of computations of diffusion parameters made from photographs of visible tracers.--Authors' abstract

137. Barad, Morton L. and Fuquay, James J. (eds.) The Green Glow diffusion program, Vol. 1. U. S. Air Force. Cambridge Research Labs., Geophysical Research Papers, No. 73, Jan. 1962. 77 p. 25 figs., 10 tables, 21 refs., 6 eqs. DWB M(055) U58g No. 73.

Source No. 137 continued

...The Green Glow program was a field investigation aimed at providing experimental data on the diffusion of an aerosol over a 16-mi range. The experiments, 26 in number and all during nighttime hours, were conducted on the Hanford reservation of the U. S. Atomic Energy Commission, near Richland, Washington, during the summer of 1959. The report of this program will be published in two volumes. This first volume includes descriptions of the field site, forecasting techniques, diffusion measuring methods, meteorological equipment, and operating procedures during the experiments. The second volume contains tabulations of the diffusion data and the meteorological data collected during the program. --Authors' abstract

138. Blackadar, Alfred K., et al. Structure of turbulence and mean profiles within the atmospheric boundary layer. Pennsylvania. State University, Mineral Industries Experiment Station, Department of Meteorology, Contract No. AF 19(604)-5231, October 1960, Final Report. 81p. 20 eqs., 41 figs., 31 refs., 5 tables. DWB M(051) P415re Final.

...Wind profiles observed at various locations are compared with wind profiles predicted by Ellison on the basis of similarity theory. It is shown that theory and observation agree well for near neutral and unstable air. However, in stable air factors not considered in the in the similarity theory appear to become important. The range of usefulness of the log-linear wind profile is shown to be small. The variance and spectrum of the velocity component at right angles to the mean wind are summarized from observations at four different places. In stable air the standard deviation of lateral velocity is proportional to the wind speed; in unstable conditions it is independent of the wind speed. The variance of lateral velocity appears not to be determined by the ordinary roughness parameter but rather by some length indicative of larger scale topographic features of the place. The spectrum of the lateral velocity component can be separated into two quite different regimes: the mechanical regime extending from very short wavelengths to about 100 m or a little longer; and the convective regime which extends down several kilometers to below 200 m. In the mechanical regime the energy is more or less constant up to 46 meters and then decreases; it varies quite critically from place to place depending on large scale roughness, and on some power of the wind speed between two and three. In the convective regime the variation from place to place is small but the variation from day to night is enormous; there is little systematic variation with height up to 23 meters and a systematic decrease with further increase of height. The breakdown of surface inversions at night at Brookhaven is closely associated with the occurrence of strong winds above 300 ft, and becomes almost a certainty when the wind at 355 ft exceed 8 m sec^{-1}. The occurrence of turbulence below 400 ft is sensitive to the Richardson number, which in the layer from 100 to 300 ft appears to have a critical value slightly larger than 0.25.--Authors' abstract

139. Blackadar, Alfred K. A survey of wind characteristics below 1500 ft. Meteorological Monographs, Boston,4(22):3-11, May 1960. eqs., 5 figs., 34 refs., 2 tables. DWB M(055) A512m V.4, No. 22.

...A survey is given of the important observational and theoretical generalization of the wind distribution up to about 500 ft., including work by Prandtl, Deacon, Monin and Obukhov, and Ellison. The vertical distribution of peak gust velocities is also discussed. Some of the less precise theories of the wind distribution above 500 ft. are also described.--Author's abstract

140. Blackadar, Alfred K. Wind velocity profiles. New York Academy of Sciences, Annals, 116(1):101-115, June 26, 1964. 7 figs., 25 refs. DLC.

...Discusses some of the solutions of limited prediction problems that have been offered, and points out some of the difficulties that lie in the way of a satisfactory solution of the problem of generalizing wind profile theories at elevations above 300 ft. The concern is with the average wind over a period of an hour or so, and not with short period fluctuations. Considers variable temperature stratification, similarity theory, adjustment of wind profiles to the underlying surface, the steady state planetary boundary layer, and nonstationary wind profiles.--M.G.A. 16.9-462

141. Boryczka, Jerzy Próba wyznaczenia klimatycznego wskaźnika turbulencyjnosci na podstawie temperatur ekstremalnych w przyziemnych warstwach atmosfery. (Attempt to determine a climatic index of turbulence on the basis of extreme temperatures for ground air layers in urban conditions.) Warsaw. Uniwerstytet. Instytut Geograficzny. Katedra Klimatologii, Prace i Studia, No. 1:70-103, 1964. Figs., refs., eqs. English summary p. 135-136. DWB.

...The magnitude of vertical turbulent exchange was derived from the vertical temperature distribution. The work was based on yearly observational data (1961) of extreme temperatures at the Warsaw Univ. Station at heights ranging between 5 and 1850 cm. The diurnal temperature amplitudes in summer showed a maximum near the ground. Various methods for determining the averaged values of the parameters entering the exponential law relating the climatic turbulence index to height were determined from the derived formulas.--M.G.A. 16.10-343.

142. Bossolasco, Mario and Dagnino, Ignazio Sulla turbolenza del vento al suolo. (Turbulence near the gound.) Geofisica e Meteorologia, Genoa, 11:83-90, 1963. 6 figs., 4 tables, 6 refs., 4 eqs. Italian and English summaries p. 90. DWB Collection.

...The behavior of turbulence (longitudinal and transversal) for 3 stations, Genoa (40 m), Monte Capellino (700 m) and Sauze d'Oulx (1865 m), equipped with identical anemographs, is analyzed. The comparison

Source No. 142 continued

of the results relative to the first two stations, separated by 17 km, shows that the friction of the ground increases the longitudinal turbulence twofold (if represented by the turbulence factor). The high thermoconvective turbulence of the prevailing NW winds at Sauze d'Oulx should be emphasized. Also proposed is a synthetic measure of turbulence for meteorological purposes - the product of the turbulence factor with lateral turbulence.--Authors' abstract

143. Canada. Department of Transport, Meteorological Branch. The micrometeorology of Douglas Point, Ontario: report on 1961 field program. Canadian Meteorological Memoirs, No. 12, by R. E. Munn. Toronto, 1963. 30 figs., 13 refs., tables DWB M(055) C212ca No. 12.

...The micrometeorology of Douglas Point (on the shore of Lake Huron) was examined for the period August 13-18, 1961. Diffusion coefficients were obtained from a bivane mounted at a height of 82 feet. Concurrent information on wind and lapse rate is included for both the land station and for Porte Dauphaine. The data observed on each day are discussed and atmospheric diffusion calculations are presented. Information is also given on meteorological instrumentation at the site and mean diurnal trends.--JAW

See also: Circular No. 3804, February 1963 for report on 1962 field program.--JAW

144. Chen, Chia-i; Tan, Sin and Dong, Su-zeng Microstructure of turbulence in the lower troposphere. Acts Meteorologica Sinica (Ch'i Hsiang Hsüeh Pao), Peking, 33(2):271-280, May 1963. 4 figs., 2 tables, 19 refs., 11 eqs. In Chinese. Chinese summary p. 271; English summary p. 280. DLC Orientale.

...Experimental data of the horizontal wind speed fluctuations at different heights from 100 to 1470 ms given by DEVEATOVA are analyzed. The main results are: 1. The horizontal wind speed fluctuations at any height may be approximated by a Gaussian distribution. 2. At a height not more than a few hundred meters the well-known "2/3 law" holds good within a length scale comparable to or several times larger than the height. 3. At higher levels, the scale range in which the "2/3 law" holds good, is usually less than the height itself and no definite relationship between this scale range and the height has been found. The representativeness of the data is also discussed.--Authors' abstract

145. Clayton, William H. and Eckelkamp, B. Jesse Improvement, evaluation and extension of capabilities of meteorological simulation. Report No. 8 Texas. A. M. College. Dept. of Oceanography and Meteorology, Contract DA 36-039 SC-84942 (Dallas Tower Program); Final Report, June 15, 1960-Nov. 30, 1962. 177 p. 58 figs. (1 fold.), 26 tables, 5 refs.

Source No. 145 continued

M(051) T355 imp.

...The purpose of this study is to conduct simulation research through a field data collection and analysis program for the improvement, evaluation and extension of capabilities of the model of the meteorological simulator developed under Signal Corps Contract DA 36-039 SC-74975. Two major investigations of meteorological import are presented in this report. The first of these, the Dallas Tower Program was conducted to provide information for the second, the improvement and extension of meteorological simulation capabilities. The presentation of the Dallas Tower Program begins with the planning of a ten-station network based on the objectives sought and is carried through the design, installation, and operation of the network and includes details of station design as well as of processing and editing of the data collected to an extent sufficient to permit realistic evaluation of all phases. The simulation research reported herein is a continuation of studies begun on an earlier Signal Corps Contract (DA 36-039 SC-74975) with primary emphasis on the acquisition and operation of the General Purpose Analog Computer for the studies.--Authors' abstract

146. Cork, H. F. Low-level inversions and wind during summer nights near Lake Erie. Canada. Department of Transport, Meteorological Branch, Circular 4077, TEC-527,July 1964. 15+p. 14 figs., 9 tables. DWB M(05) C212c CIR 4077.

...In 1959, 1960 and 1961 extensive instrumentation was installed near Port Burwell on the north shore of Lake Erie, during the growing season for tobacco, for the purpose of studying meteorological parameters involved in the formation of weather fleck (tobacco plant disease). Some of the data obtained were suitable for a study of relationships between wind and low-level nighttime inversions. Such information should be useful for air pollution studies and for biological control operations involving the application of herbicides and pesticides in the form of mists. Temperature data were obtained from heights of 20 and 100 feet and wind data from 100 feet. The following tabular data are presented: frequency distribution of total hours with inversions per night; frequency of various inversion intensities for each hour of the night; and correlation of inversion intensity with intensity of preceding hour when winds are light (0.0-4.9 mph), moderate (5.0-9.9 mph) and strong ($\geq$ 10.0 mph) during the present hour.--JAW

147. Diaconescu, Gh. I. Comportarea în înăltime a coeficientului de turbulenta în statul limită al atmosferei. (Variation with height of the turbulence coefficient in the boundary layer of the atmosphere.) Meteorologia, Hidrologia si Gospodarirea Apelor, Bucharest, 5(4):281-285, 1960. 4 figs., 2 tables, 10 refs., 3 eqs. DWB.

Source No. 147 continued

...The vertical distribution of meteorological elements and of atmospheric phenomena (temperature, humidity, wind, fog, etc.) depends upon the distribution of the turbulence coefficient. In order to obtain additional information regarding the variations of this coeffcient for a layer of air from 100 m to 1500 m from the ground, the author used the experimental data obtained by the Aerological Observatory of Bucharest (Baneasa) between 1950 and 1956. For calculating the turbulence coefficient ($K_{(z)}$), the author used the method suppested in 1952 by D. L. Laihtman of the Univ. of Leningrad. However, in order to avoid certain limitations of this method, the author considered the air stratum divided into several layers which were analyzed separately. The values obtained for the coefficient $K_{(z)}$ are shown in tables and diagrams according to height and season. In conclusion, the author states that in the lower air layer (100-300 m) the value of $K_{(z)}$ increases in a linear manner; in the middle zone (600-1000 m) the $K_{(z)}$ coefficient maintains a relatively constant value; while in the uppermost layer (1500 m or over) it varies irregularly but generally decreases toward a limit which he calls "residual turbulence." The above mentioned conclusions are mostly of an informative nature, and could be further improved.--M.G.A. 15.7-353.

148. Deane, Roger E. Limnological and meteorological observation towers in the Great Lakes. Limnology and Oceanography, Lawrence, Kansas, 8(1):9-15, Jan. 1963. 3 figs., table. DLC.

...Six limnological and meteorological single-shaft towers of 4-in. pipe were installed in 3 of the Great Lakes by the Great Lakes Institute, Univ. of Toronto. The towers were of two types, a shallow-water tower for depths of less than 60 ft where the base of the tower rested directly on the lake bottom, and a deep-water tower supported by a buoyancy tank 25 ft below lake level. A platform on the towers, situated 8 to 12 ft above lake level, gave a stable base to house limnological and meteorological instruments and recorders. The platform and upper part of tower were designed for easy removal and reinstallation.--Author's atstract

149. Dolgushin, I. P. and Novikova, D. V. Rezul'taty nabliudenii nad napravieniem i skorost'iu vetra na vysote 100 m s ispol'zovaniem televizionnoĭ machty v g. Gor'kom. (Results of observations of wind direction and speed at a height of 100 m using a television tower in Gorki.) Vsesoiuznoe Nauchnoe Meteorologischeskoe Soveshchanie, 1st, Leningrad, 1961, Trudy, 7:161-169. Leningrad, 1963. 7 figs., 2 tables. DWB M(06) V985tr V.7.

...Concurrent records of wind velocity obtained in Sept. 1958 at 13.6 m with the M-12 recorder and with the weather vane are cited to show the reliability of the recorder at lower heights. During 1960 concurrent records of wind velocity and direction were obtained with weather

Source No. 149 continued

vanes (with heavy and light boards) and an M-12 recorder at 13.6 m, and with a recorder the sensor of which was at 104 m on the Gorki television tower. These records are compared and the ones obtained at 104 m are related to radiosonde observations at 100 m. The results discussed and presented in wind velocity graphs and in wind roses are summarized. It is concluded that: the M-12 recorder is fully reliable at heights up to 15 m and can adequately replace the weather vanes used by the network; the instrument records of wind velocity and direction at 104 m agree well with radiosonde data at 100 m; Jan. readings at 104 m were lower due to icing.--M.G.A. 16.4-404

150. Elliott, William P. The vertical diffusion of gas from a continuous source. International Journal of Air and Water Pollution, London, 4(1/2):33-46, June 1961. 5 figs., 2 tables, 4 refs., 11 eqs. DWB M(05) J61 ap V.4.

...An empirical investigation of the form of the vertical profile of gas concentration indicates that SUTTON's suggested parameters have somewhat limited applicability. The term $\exp(-z^{-a\beta})$ is examined for values of a and β. The findings indicate that the value of 2.0 for a, as suggested by SUTTON, is an overestimate except in fairly stable conditions. Values of 1.5 seem more appropriate for near neutral conditions and values less than 1.5 for unstable conditions. The data used for this study were obtained during Project Prairie Grass, a field program in diffusion conducted over short grass on level prairie land. The observations were made at 100 m from the sources to a height of 17.5 m. 41 cases are discussed during which the wind speeds at 2 m varied from 1.4 to 9.4 m/sec.--Author's abstract

151. Fuquay, James J. et al. Results of recent field programs in atmospheric diffusion. Journal of Applied Meteorology, Boston, 2(1):122-128, Feb. 1963. 9 figs., 4 refs. DWB M(05) J86 joa V.2, No. 1.

...During the summer of 1959, the Green Glow Program, consisting of 26 diffusion experiments during nocturnal inversions, was conducted at the Atomic Energy Commission's Hanford Site near Richland, Wash. The tracer, zinc sulfide, was released near ground level. Samplers were placed at 1.5 m above ground at 533 positions on six sampling arcs, the radii of which were 200 m, 800 m, 1.6 km, 3.2 km, 12.8 km, and 25.6 km. In addition to the ground sampling network, poles or towers were erected at 5 points, 8 deg apart, on each of the 4 inner arcs. Fifteen samplers were mounted on each pole or tower, the top level increasing from 27 m on the 200-m arc to 62 m on the 1.6-km and 3.2-km arcs. General aspects of the experimental design and tracer technique are discussed along with terrain characteristics and meteorological conditions pertinent to these experiments. Experimental results are presented showing the increase in horizontal plume width and decrease of

Source No. 151 continued

maximum exposure with distance from the source. An analysis of the area enclosed within a given exposure isopleth is summarized. The effect of significant wind direction shear on the vertical distributions of exposure is discussed. Results from the Green Flow experiments are compared with those from earlier diffusion experiments at O'Neill, Nebr., and later experiments at Hanford.--Authors' abstract

152. Gerhardt, J. R. (Univ. Texas) An example of a nocturnal low-level jet stream. Journal of the Atmospheric Sciences, Boston, 19(1): 116-118, Jan. 1962. 2 figs., 4 refs. DWB M(05) A512j V.19.

...Time and height variations encountered during a typical jet stream as observed from the Cedar Hill facility at Dallas, Tex. are presented. A figure shows the total wind vectors as observed at each of the 12 levels at hourly intervals from 0100 CST to 0900 CST. The jet reached its maximum intensity by 0709 when the largest wind direction change over the 1400 ft height interval also occurred. One hour later the jet disappeared and there was little indication of any wind direction shear. The similarity of the structure to the lower level stability is shown in a figure where temperature-height profiles are plotted for corresponding hours.--M.G.A. 13.9-602

153. Gerhardt, J. R.; Mitcham, W. S. and Straiton, A. W. 1400-ft meteorological tower with automatic data readout. Institute of Radio Engineers, N. Y., Proceedings, 50(11):2263-2271, Nov. 1962. 5 figs., 7 footrefs. DWB P Collection.

...This paper describes the meteorological and data readout instrumentation on a 1400-ft television tower near Dallas, Tex., with sensors located at 12 levels for observing wind and temperature. The data provided by the 36 sensors are integrated for preset intervals, sampled periodically and read out automatically onto punched tape and an electric typewriter. Salient features of the installation are described and samples of the data are shown. As illustrations, meteorological data taken during the passage of Hurricane Carla in the Fall of 1961 and during a low level jet situation are presented.--Author's abstract

154. Hansen, Frank V. Turbulence characteristics of the first 62 meters of the atmosphere. U. S. Army. Electronics Research and Development Activity, White Sands Missile Range, New Mexico, ERDA-100, December 1963. 44p. eqs., 14 figs., 11 refs., 15 tables. DWB M(055) U5812er ERDA-100.

...Turbulent characteristics of the first 62 meters of the atmosphere in the vicinity of the U. S. Army Electronics Research and Development Activity's Meteorological Research Tower are established for neutral conditions. The assumption was made that the roughness length is a constant, but dependent upon wind direction, fetch, and the height of

Source No. 154 continued

the roughness elements. Data are presented for five recording periods during the late winter and early spring of 1958 and 1961. Computations of the basic wind profile and turbulence parameters are presented in tabular form.--Author's abstract

155. Hosler, Charles R. Low-level inversion frequency in the contiguous United States. U. S. Weather Bureau, Monthly Weather Review, 89(9): 319-339, September 1961. 9 figs., 12 refs., 6+1 append. tables. DWB M(05) U587m V.89.

...A tabulation of percent frequencies of inversion and/or isothermal conditions, based below 500 feet above station elevation, for Weather Bureau radiosonde stations in the contiguous United States for four observation times, provides a sampling of daytime and nighttime stability conditions for all time zones. These data are analyzed with respect to nighttime surface wind speed and cloud cover. Radiosonde data are compared to vertical temperature gradient data obtained from meteorologically instrumented towers and valley ridge stations. Finally, an attempt is made to delineate, geographically and climatologically, the percent frequency of low-level stability for the entire country.--Author's abstract

156. Intermountain Weather Inc. Spacial variations of various meteorological parameters. Scientific Report No. 4, by J. Vern Hales and Joseph K. Sleater. May 1962. 28p. 5 figs., 11 refs., 8 tables. DWB M(051) I61sc1 No. 4.

...The spacial variations between four stations located within 18 miles of each other (San Antonio International Airport, Brooks AFB, Kelly AFB, and Randolph AFB) were computed on the basis of the 1800 CST surface observations for the ten year period from February 1948 through January 1958. The average difference standard deviations in the seven parameters studied are: ceiling height, 4100 feet, dew point temperature, 4.9°F; wind direction, 37 degrees; wind speed, 416 mph; temperature, 1.8°F; dew point spread, 5.3°F and equivalent potential temperature, 3.5°C. In the authors' opinion, the difference standard deviations (except for ceiling) indicate a practical limit to the degree of precision which would be significant when forecasting one of the parameters investigated. The dependence of the parameter variations on the four station mean dew point temperature was studied for the various station combinations. The ceiling height, dew point temperature, wind speed, and dew point spread variations showed a high correlation with the four station mean dew point temperature. Graphs were constructed which showed the seasonal trend of the parameter variations. The wind speed, wind direction, and equivalent potential temperature variations indicate a seasonal trend, with the summer months having the highest variations.--Author's abstract

157. Islitzer, Norman F. Short-range atmospheric-dispersion measurements from an elevated source. Journal of Meteorology, Boston, 18(4):443-450, Aug. 1961. 12 figs., table, 9 refs., 11 eqs. DWB M(05) A512j V.18.

...Dispersion measurements of a tracer, uranine dye in solution, were made out to two miles from the release point in unstable atmospheres. The tracer was released from the top of a 150-ft tower and sampled at ground level by 100 high-volume air samplers. Some sixteen releases for 30-min periods were analyzed. Techniques of dispersal, collection and analysis of the tracer are included. Meteorological measurements during the tests included vertical and horizontal-wind-direction fluctuations at several levels on the 150-ft tower and vertical temperature difference. Measured air concentrations agree well with those predicted from a meteorological model using wind-direction variances as dispersion parameters. Prediction equations are also empirically developed for computing the distance to maximum ground-level air concentration and for lateral particle variance to 2 mi. The measured vertical inhomogeneity of turbulence does not prevent a fair agreement between predicted and measured surface air concentrations when only source-height wind data are used. Since the dispersion parameters were determined at the time of the diffusion experiments, the observed and computed results are not independent. Independent test data were not available for a more rigorous check of the method.--Author's abstract

158. Izumi, Yutaka The low-level jet. U. S. Air Foce. Cambridge Research Labs., Air Force Surveys in Geophysics, No. 140, Vol. 1:71-79, March 1962. 4 figs., 3 refs. DWB M(055) U58as No. 140.

...The 1428-ft television transmitting tower located at Cedar Hill near Dallas, Tex., and mounted with instruments to make continuous measurements of wind and temperature at 12 levels from 30-1420 ft above ground, is proving to be a useful research tool for investigating low-level meteorological phenomena, especially the low-level jet. During the night of Feb. 22-23, 1961, a pronounced low-level jet was observed. A detailed account of the orderly growth of the nocturnal jet, the accompanying temperature profiles, and the maximum wind speed and shear attained will be discussed.--Author's abstract.

159. Izumi, Yutaka and Barad, Morton L. Wind and temperature variations during development of a low-level jet. Journal of Applied Meteorology, Boston, 2(5):668-673, Oct. 1963. 12 figs., table, 4 refs. DWB M(05) .J86joa V.2.

...The 1428-ft television transmitter tower, located at Cedar Hill, Tex., and instrumented to obtain continuous measurements of wind and temperature at 12 levels from 30-1420 ft. above ground, is proving to be a useful research tool for investigating low level meteorological phenomena, especially the low level jet. During the night of Feb. 22-23, 1961, a pronounced low level jet was recorded. Systematic variations

Source No. 159 continued

of wind speed and temperature with time and height will be discussed to illustrate the orderly development of the low level jet, the upward growth of the nocturnal inversion, and the vertical extent of the mixing process within the deepening inversion.--Authors' abstract

160. Jagannathan, P., Das, U. S. and Datar, V. V. On winds at Poona. Indian Journal of Meteorology and Geophysics, Delhi, 15(1):3-26, January 1964. 21 eqs., 6 figs., 5 refs., tables. DWB M(05) I39: V.15, No. 1.

...The diurnal and seasonal characteristics of wind at a height of 130 ft above ground at Poona have been studied on the basis of anemographic data collected during the period 1949 to 1958. It is seen that a considerable part of the variation in the mean wind at any time is ascribable to variation due to the seasons and anext in order comes the diurnal variation. The periodic variation of the mean wind speed, the range of gust and the gustiness during the course of the day could, to a fair degree of accuracy, be represented by the first two harmonics, the first of period of 24 solar hrs and the second 12 solar hrs. The seasonal variation of the means, the amplitudes and phase angles of the diurnal and semidiurnal waves have been studied. To get an insight into the structure of the diurnal wind variation the 24-hr and 12-hr component oscillations have been separated out. The features of the hodograph ellipse during the different seasons have been discussed.--Authors' abstract

Tables show the following monthly data: variation of wind speed hour by hour (standard deviation); mean hourly wind speed; mean hourly range of gust; mean hourly gustiness of wind; vector mean winds hour by hour and components of diurnal and semi-diurnal waves of wind speed, of average range of gust and of mean gustiness of wind.--JAW

161. Kawanabe, Yasuji, Vertical wind profile below 300 m. Kobe, Japan. Marine Observatory, Bulletin, No. 172:93-118, March 1964. 27 figs., 5 tables, 28 refs. In Japanese; English summary p. 93. DWB.

...The vertical wind profile was studied on the basis of observations at Tokyo Tower and in the Inland Sea. The results at Tokyo Tower were compared with those obtained in foreign countries. The observations in the Inland Sea were carried out by the method of double theodolites observation in narrow channels, which showed complicated results under the influence of topography. Vertical sections and profiles of wind were analyzed and it was discussed how the air flow was changed in passing over a mountain.--Author's abstract

162. Klinov, F. Ia. Studies in the surface layer of the atmosphere on towers and masts. Translation No. 16-61 by personnel at Technical Library, ARGMA, Redstone Arsenal, Alabama, from Meteorologiia i Gidrologiia, 12:37-42, 1960. 39refs., table. DWB M07.7 K65st.

Source No. 162 continued

...This paper is a review of recent work using instruments mounted on towers and masts. The studies undertaken by such means can be divided into three types: gradient investigations in which measurements are made of the diurnal variations and the profiles of various meteorological elements; structural investigations in which measurements are made of the turbulent and vortex structure of the atmosphere and physical investigations where relationships are sought between the variations of various nonmeteorological and meteorological parameters. The author sets out some of the conclusions which can be drawn from already published work and in conclusion lists the various problems which can be studied using towers and masts.--JAW

163. Lappe, U. and Oscar and Davidson, Ben. On the range of validity of Taylor's hypothesis and the Kolmogoroff spectral law. Journal of the Atmospheric Sciences, Boston, 20(6):569-576, Nov. 1963. 10 figs., 19 refs., 9 eqs. DWB M(05) A512j V. 20, No. 6.

...Turbulence measurements obtained from concurrent tower and aircraft observations are analyzed to test G. I. Taylor's hypothesis (1938) of the equivalence between Eulerian space and Eulerian time spectra. The correlation and spectral data (along with data obtained from three other airplane turbulence programs) were also examined to ascertain the validity of KOLMOGOROV's prediction (1940) for the behavior of the correlation coefficients and spectral densities in the inertial subrange. At heights of 300-400 ft above the ground, the tower and aircraft observations provide the same turbulence spectrum for wavelengths at least as large as 600 and 900 ft, for mean wind speeds ofabout 20 and 30 ft sec^{-1}, respectively. The evidence is that the Kolomogorov range is not approached for the wavelength range examined in this paper. The shortest wavelength sampled is on the order of 88 ft, at heights above the ground ranging from 200 to 2000 ft. It appears that at these heights, the Kolmogorov spectrum, if valid, can apply only to wavelengths shorter than 88 ft.--Authors' abstract.

164. McVehil, G. E. Wind and temperature profiles near the ground in stable stratification. Royal Meteorological Society, Quarterly Journal, 90(384):136-146, April 1964. 16 eqs., 5 figs., 20 refs., 2 tables. DWB M(05) R888q V.90.

...Observed wind and temperature profiles from O'Neill, Neb. and Antarctica are analyzed to determine their characteristics in inversion conditions. Analyses of the similarity between wind and temperature profiles are presented. These show that the profiles are generally similar when the Richardson number is small. However, there is strong evidence in the Antarctic data for a departure from similarity and a decrease in the ratio of eddy condictivity to eddy viscosity for Richardson numbers >0-08.

Source No. 164 continued

It is shown that the log-linear wind profile fits the observations well for Richardson numbers less than about 0.14. The constant in the log-linear equation is found to have a value of approximately 7 in stable air, implying a critical gradient Richardson number of 1/7. From the log-linear theory, heat flux and surface stress can be calculated given winds at two levels and the surface roughness. Predicted values are compared with observations. The agreement is good in the case of surface stress and fair for heat flux.--Author's abstract

165. Meteorology Research, Inc., Altadena, California. Vertical diffusion from a low altitude line source-Dallas Tower studies. Volumes I and II. Final Report to Contract No. DA-42-007-CML-504, December 1961, by P. B. MacCready, T. B. Smith and M. A. Wolf. Vol. I-56+p. eqs., 28 figs., 11 refs., 15 tables. Vol. II-6+p. 2 tables, 74 figs. DWB M(051) M589rpt Final.

...A series of diffusion tests using an aerial line source release were made in the vicinity of the Dallas TV tower at Cedar Hill, Texas. A total of thirty-seven tests were carried out in three two-week intervals in April, June, and August, 1961. Extensive use has been made of Air Force-sponsored wind and temperature measurements made at various levels on the 1420 foot TV tower. Bivane wind sensors were added to the tower instrumentation to provide direct measurements of turbulence. Vertical sampling of the FP material was accomplished by sequential filter samplers at various levels on the tower and by rotorod samplers located on the ground one mile apart to a distance of about 30 miles downwind from the release line. During a portion of the tests a crosswind rotorod line was added near the downwind end of the main ground sampler line. The primary objective of the program was to relate measured diffusion characteristics of the cloud to observed turbulence, wind velocity, and temperature observations in a quantitative manner. This information was to be obtained under a variety of meteorological and release height conditions. The principal analysis effort concerned itself primarily with explanations of the observed cloud widths on the tower, the distrance from the release line to the first appearance of the cloud at the ground, and the location and magnitude of the maximum dosage at the ground. Time limitations did not permit analysis of numerous other features of interest obtainable from the data.--Authors' abstract

Data sources and procedures for calculating geostropic winds, effective turbulence sigmas and mean wind velocity are given in Volume I. The basic test data on a portion of the routinely processed data are given in Volume II.--JAW

166. Moses, Harry and Daubek, Hugh G. Errors in wind measurements associated with tower-mounted anemometers. American Meteorological Society, Bulletin, 42(3):190-194, March 1961. 3 figs., 2 refs. DWB M(05) A512b V.42.

Source No. 166 continued

...Towers distort the wind flow and thereby may produce errors in wind speed and direction measurements obtained by anemometers mounted on them. To study this effect, a comparison was made of 5000 hourly wind observations obtained from each of two Aerovanes operating simultaneously. One was mounted on a lattice-type tower and the other was mounted on a utility pole free from the tower wind-shadow effect. Both instruments were located at the meteorological field site of the Argonne National Laboratory. The results show that there was a substantial reduction in the wind speed indicated by the tower-mounted anemometer when the wind passed through the tower before being measured. For some wind directions, the tower-mounted anemometer gave speed readings appreciably higher than those of the reference anemometer. Wind-direction measurements were also affected. The data indicate that for precise work the tower wind-shadow effect must be considered.--Authors' abstract

167. Munn, R. E., Emslie, J. H. and Wilson, H. J. A preliminary analysis of the inversion climatology of Southern Ontario. Canada. Meteorological Branch, Circular 3838, TEC-466, April 1963. 42p. 26 figs., 16 refs., 3 tables. DWB M(06) C212c Cir 3801-96.

...Temperature differences in the lowest few hundred feet of the atmosphere are being measured continuously at a number of points in southern Ontario: Sarnia, Hamilton, Ottawa, Chalk River and NDP Rolphton. The network is supplemented by readings from television tower WJBK, Detroit and a 200 feet tower in Montreal, P.Q. There are also a few measurements from Douglas Point, Ottawa and Toronto made from an 80 feet portable tower. Finally, several hundred Tethered balloon profiles of temperature are available from Douglas Point, Toronto, Scarborough, and Chalk River. A description of the network is given, followed by some preliminary estimates of inversion frequencies. The effect of town and country, the Great Lakes, and the Ottawa valley are illustrated. The implications for air pollution studies are also considered.--Authors' abstract

168. Munn, R. E. The micrometeorological tower at Resolute, N.W.T. Arctic, Montreal, 16(3):198-200, September 1963. 2 figs., DWB P Collection.

...The purpose of this note is to call attention to the existence of a 100-ft. micrometeorological tower at Resolute in the Canadian Arctic. No meaningful wind data have been derived by the vertical temperature difference system that has been operating since August 1957. The diurnal and seasonal character of the vertical temperature gradient near the ground is illustrated. Notes that inversions are to be expected during the Arctic winter and will require consideration when industrial activity begins expanding northward.--JAW

169. Munn. R. E. and Richards, T. L. The micrometeorology of Douglas Point, Ontario: Report on 1962 field program. Canada. Meteorological Branch, Circular 3804, TEC-455, February 1963. 97p. eqs., 34 figs., 9 refs., 5 tables. DWB M(06) C212c Cir 3804.

...A study of the micrometeorology of Douglas Point, Ontario based on data collected during the winter of 1961-62. Data was also collected from Paisley Island Station and by the R/V Porte Dauphine. The daytime lake breeze occurs frequently in spring and early summer causing an inversion at Douglas Point. Tethered balloon flights are used to illustrate the effect. Diurnal cycles (summer season) are displayed for net all-wave radiation, temperature, lapse rate, wind, wind shear and natural background radioactivity. Particular attention is directed to the evening low-level jet stream and inversion peak. The report also includes climatic data and a brief description of the effect of wind direction on water temperature. --JAW

See also: Canada. Meteorological Branch, Canadian Meteorological Memoirs, No. 12, by R. E. Munn, for report on 1961 field program. DWB M(055) C212ca No. 12--JAW

170. New York University. Department of Meteorology and Oceanography. The power spectral analysis of concurrent airplane and tower measurement of atmospheric turbulence. by U. Oscar Lappe and Ben Davidson. January 1960. 36p. 27 figs., 9 eqs., 12 refs., 2 tables. DWB M(051) N532fin.

..."A power spectral analysis of concurrent airplane and tower data obtained during operation Tri-Tower was conducted. The objectives of this analysis were to: 1) determine the equivalence of the airplane and tower measurements and 2) investigate spectral behavior with respect to meteorological and terrain conditions."--Author's abstract

171. New York University. Department of Meteorology and Oceanography Power spectrum analyses of turbulent surface winds over water under inversion conditions. Technical Report, by Joseph Pandolfo. July 1961 68p. 13 figs., eqs., 28 refs., tables. DWB M(051) N532t.

...Eight observations of the longitudinal, lateral, and vertical components of turbulent wind at 3 meters above the water surface in the wind speed range 3.5-6 meters per second and under inversion conditions are described. These observations were made over Long Island Sound during the summer of 1958 using a bivane-anemometor sensor system. Sensor outputs were recorded graphically with overall sensor-recorder response characterized by a time constant of .7 seconds. Continuous 15-20 minute recordings were read at once per second for digital power spectral analyses. Estimates of the effects on spectral shapes and variances and spectra of individual components and cross-spectra and cross-covariances of the longitudinal and vertical components are presented. Observed variances generally increase with increasing

Source No. 171 continued

wind speed and with decreasing inversion strength. Variances and spectra are consistent with those obtained from the few previous observations over water and from observations over a short-grass surface when differences in wind speed, temperature stratification, and instrumental response are taken into account. Satisfactory measurements of the turbulent shearing stress are not obtained, due to the inadequacies in instrument sensitivity under the conditions encountered. Therefore an investigation of possible relationships between turbulent fluxes and the turbulent integral scales is described. A theoretical relationship is derived which is apparently consistent with observational results of the Prairie Grass program and which should be more widely applicable. This relationship essentially gives a Prandtl mixing length in terms of measurable statistical parameters of turbulent field.--Author's abstract

172. Panofsky, H. A. and McCormick, R. A. The spectrum of vertical velocity near the surface. Royal Meteorological Society, Quarterly Journal, 86(370):495-503, October 1960. eqs., 9 figs., 20 refs., table. DWB M(05) R888q V.86.

...Observations of a considerable number of vertical-velocity spectra are combined to show that under near neutral and unstable conditions, the shape of the spectrum is essentially invariant up to heights of order 100 m, and the 'scale' of turbulence is proportional to height within this regime. A semi-empirical working hypothesis is suggested which relates the spectrum to wind speed, lapse rate, height and roughness.--Authors' abstract

173. Panofsky, H. A. and Singer, I. A. Vertical structure of turbulence. Royal Meteorological Society, Quarterly Journal, 91(389):339-344, July 1965. Figs., tables, refs., eqs. DWB M(05) R888q V.91.

...Based on fluctuation statistics from the Brookhaven tower, statistical models are presented which permit estimation of cross-spectra between wind components at various heights. It is shown that a similarity hypothesis, proposed by Davenport (1961), seems to be valid. The upper portions of turbulent eddies are downwind of the lower parts, with slopes of order unity, probably dependent on wind shear.--Authors' abstract

174. Rao, M. S. V.; Sidkar, D. N. and Chandrasekharan, C. K. Vertical wind shear in the lowest layers of the atmosphere over Thumba during winter months: a preliminary study. Indian Journal of Meteorology and Geophysics, Delhi, 16(2):221-228, April 1965. figs., tables, refs. DWB.

...Vertical wind shear in the lowest layers of the atmosphere over Thumba--an equatorial station--has been studied. Wind data from the surface up to 200 ft were collected at different altitudes (8,31, 56,

134 and 200 ft) during the months December 1963 and January 1964, for the above study. Analysis reveals that appreciable wind shear exists very close to the surface, i.e., in the layer up to 31 ft. On the other hand, in the layer 31-200 ft, the shear values are not considerable. It is further observed that the shear magnitude reaches maximum in the afternoon. The frequency of occurrence of shear magnitudes more than 10 kts/30 m (which, as indicated by ICAO, is important for supersonic transport operation) is high in the lowest layer round about 1430 IST during the winter months.--M.G.A. 16.9-463

175. Richards, T. L. The Douglas Point Project - An analysis of surface wind data. Canada. Department of Transport, Meteorological Branch, Circular 4092, TEC-534, August 1964. 12+p. 11 figs., 6 refs., 28 tables. DWB M(06) C212c CIR 4092.

...At the request of Atomic Energy of Canada Ltd., and the Hydro-Electric Power Commission of Ontario, the Meteorological Branch has undertaken several studies involving the climatology and micrometeorology of the Douglas Point, Ontario area. This particular study involves the analysis of surface wind data for the two-year period from July 1961 to June 1963, using machine methods.--Author's abstract

Tables present the following data for Douglas Point (2 years period of record) and Southampton, for comparison purpose (2-years and 5-years period of record): annual percentage frequency of occurrences of winds in eight directions grouped according to various wind speeds; seasonal percentage frequency of occurrences of winds in eight directions grouped according to various wind speeds for all hours and for 0200-0900, 100-1700 and 1800-0100 EST: and monthly duration (by hour classes) of calm and light winds (0-3 mph) and strong winds ($\geq$ 10.0 mph).--JAW

176. Saito, Tako Wind velocity profile within plant communities. Journal of Agricultural Meteorology, Tokyo, 19(2):53-58, Nov. 1963. 4 figs., 4 refs., 12 eqs. In Japanese; English summary p. 57. DWB M86:630 S678j V.19, No. 2.

...Observed wind velocity profiles within crops are explained by using data from corn field (Stoller and Lemon) and data from wheat fields (Penman and Long). An inter-relation of variation of turbulent diffusivity with height and wind velocity is obtained. Normalized velocity profiles in corn fields are shown for several wind velocities at a crop surface in a fig. From the evidence that these profiles are in good agreement with each other, it is seen that wind velocity gradient is proportional to wind velocity. We have $\frac{du}{dz} = p(z) \cdot u$

$p(z)$ is a function depending only on height, which results from the observed wind profiles within crop. If $u=u_H$ at crop surface $z=H$.--Author's abstract

177. Sanders, Leslie D. NSSL mesoscale network of surface stations. Environmental Science Services Administration, Weather Bureau, National Severe Storms Laboratory, Report No. 24, Technical Note 3-NSSL-24, August 1965. pp.131-139. 3 figs., 4 refs., table. DWB M(055) U5852re No. 24.

...In an attempt to acquire new knowledge of surface circulation patterns of severe thunderstorms and other mesoscale weather phenomena, special networks of recording stations have been operated by NSSP and NSSL since 1961. A brief history of these operations is followed by a detailed description of the present 52-station mesonetwork operated by NSSL in south-central Oklahoma during the spring severe storm season.--Author's abstract

178. Singer, Irving A. U. S. Brookhaven National Laboratory, Upton, N. Y. A study of the wind profile in the lowest 400 feet of the atmosphere. Signal Corps Contract No. R-65-9-99812 SC-04-91, DA Project No. 3A99-07-001-03. Project Report No. 5. January 1960 50p. append. tables, eqs., 8 figs., 6 refs., 4 tables. Project Report No. 6, May 1960, by Irving A. Singer and Leo J. Tick. 12p. eqs., 2 refs. Project Report No. 7, September 1960, by Irving A. Singer and Constance M. Nagle. 20p. append. tables, eqs., 5 figs., 6 refs., 5 tables. Project Report No. 8, January 1961 by Irving A. Singer and Constance M. Nagle. 28p. append. tables, eqs., 2 figs., 4 refs., table. Project Report No. 9, September 1961, by Irving A. Singer and Constance M. Nagle. 44p. append. tables, eqs., 2 figs., 3 refs., table. DWB M(051) U582pro Nos. 5-9.

...The object of this study is to obtain a reliable estimate of the wind profile between 37 and 355 feet above the ground, based on a single wind measurement at 37 feet and associated simple measurements or observations. The period covered by these reports is October 16, 1959 to September 15, 1961.

...This report covers the first portion of a detailed study of the predictability of wind speed at one height from speeds at one or two reference heights. Two types of predictors are studied: the first is achieved by a simple multiplication of the wind speed average at one height by a constant to obtain the corresponding average at the other height; and the second by a procedure that gives the best prediction possible by linear methods. This second method, although not applicable under actual conditions, provides a benchmarck by which any other predictor may be evaluated. The analysis in this report is made by examining the variance or standard deviation of the difference between the predicted value of the wind speed and the observed value. The following cases are examined: A. Best possible linear predictor; B. Simple linear predictor, (1) One reference height, (2) Two reference heights. The error curves are presented and effects are evaluated.--Author's abstract - Report No. 5

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A summary is presented of all the models needed for this study of the variation of wind with height. The models developed to date are reviewed, and the following additional cases are examined: 1) Prediction of wind speed from the wind speed at a reference level by using an unweighted predictor of varying averaging length and relative displacement in time. 2) Prediction of wind speed from components at the reference level by using a simple unweighted predictor. 3) Prediction of wind speed from components at the reference level by using the "best possible" linear predictor.--Authors' abstract--Report No. 6

...This report covers the detailed testing of the predictability of wind speed from the wind speed at a lower reference level by using an unweighted predictor of varying average length and relative displacement in time. Two models were tested and compared to the "best possible" linear predictor: (1) the simple model previously described, and (2) the mean model developed in this report. Four different gustiness conditions were analyzed to show the effects of lagging the reference level 0,30, 60, 90, and 120 sec and increasing its averaging length by factors of 1, 2, and 4. The predicted averaging lengths studied were 3, 12, 30, 60, and 180 sec. It is assumed in using the predictor models that the average wind speeds are known or can be estimated. Therefore, the ability to predict the hourly average wind speeds at 355 ft from the 37-ft level for a 2-mo period by using a power law relationship was also tested, and the preliminary results are presented.--Authors' abstract--Report No. 7

...This report continues the analysis of errors in predicting upper level wind speeds from speeds at a lower reference level by using an unweighted predictor of varying averaging length and relative displacement in time. In previous reports this analysis was always a "forecast", with the mean at the reference level starting before the mean at the prediction level. For this report the same data were used to make a "hindcast", and the results were evaluated. It is necessary to know the average wind speed for all previously developed models. Thus, a detailed study was completed of the variation of p (obtained from the power law) with solar time and wind speed. In the previous analyses it was noted that the mean wind speed does not always increase with height. An outline is given of the theoretical approach to be used in evaluating this condition. Test procedures to evaluate the effect of displacing the reference level horizontally are described. A 50-ft portable mast will record data at distances up to 750 ft from the meteorological tower.--Authors' abstract-- Report No. 8

...This report continues the analysis of errors in predicting upper level wind speeds from speeds at a lower reference level by utilizing an unweighted predictor of varying averaging length and relative displacement in time. Data were obtained by displacing a 50-ft mast 68, 152, and 225 meters from the Ace tower. These data were than analyzed

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to determine the location producing the least prediction error. A study of the prediction of wind speed was made by using horizontal components at the reference level; however, no improvement occurred in the prediction errors.--Author's abstract--Report No. 9

179. Singer, Irving A. and Nagle, Constance M. Study of the wind profile in the lowest 400 feet of the atmosphere. U. S. Brookhaven National Lab., Contract R-65-8-99812-Sc-04-91, Progress Report No. 8, Sept. 16, 1960 - Jan. 15, 1961. Issued Jan. 1961. 28 p. 2 figs., numerous tables, 4 refs., 3 eqs. DWB M(051) U582 pro No. 8.

...This report continues the analysis of errors in predicting upper level wind speeds from speeds at a lower reference level by using an unweighted predictor of varying averaging length and relative displacement in time. In previous reports this analysis was always a "forecast", with the mean at the reference level starting before the mean at the prediction level. For this report the same data were used to make a "hindcast", and the results were evaluated. A detailed study was completed of the variation of P (obtained from the power law) with solar time and wind speed. In previous analyses it was noted that the mean wind speed does not always increase with height. An outline is given of the theorretical approach to be used in evaluating this condition. Test procedures to evaluate the effect of displacing the reference level horizontally are described. A 50-ft portable mast will record data at distances up to 750 ft from the meteorological tower.--Authors' abstract

180. Singer, Irving A. and Nagle, Constance M. Study of the wind profile in the lowest 400 feet of the atmosphere. U. S. Brookhaven National Laboratory, Contract R-61-5-Sc-01-91, Final Report, March 31, 1962. 32 p. 30 figs., 4 tables, 14 refs., numerous eqs. DWB M(051) U582 pro Final.

...This report summarizes all phases of a detailed study of the predictability of the scalar horizontal wind speed at an upper elevation from wind data obtained at lower reference heights over varying averaging lengths. To study this predictability, several mathematical models were developed. The first, or "simple", model was achieved by multiplying the reference speed by a constant to obtain the corresponding average at the higher elevation. This form was suggested by the power law describing the variation of the mean wind speed with height. The simple model, which employs spectral and crossspectral computation, was used to evaluate the mean square error over various averaging lengths. The second or "mean" model has the same general form as the first, but the mean value of the wind speed at all levels is subtracted from the actual wind speed prior to computation of the mean square error. The final model produces the best possible predictor using linear methods. This "best possible" model, although

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not applicable under actual conditions, provides a benchmark with which the mean square errors from other linear models can be compared. Such comparison clearly indicates that the mean model is an excellent approximation to the best possible. To evaluate the effect of time and space displacement of the reference level, a wind instrument on a portable 50-ft mast was placed at several locations, at each of which several runs were completed. The error analysis for all three models indicated that Taylor's hypothesis can be used to reduce the error caused by displacing the reference instrument. To insure wind data of sufficiency accuracy for evaluation of the models, a rigorous calibration procedure was developed. In addition, a special data reduction system was used to facilitate recording and processing of the data.--Authors' abstract

181. Singer, Irving A.; Nagle, Constance M. and Brown, Robert M. (all, Brookhaven Natl. Lab., Upton, Long Island, N. Y.) Variation of wind with height during the approach and passage of hurricane Donna. U. S. Weather Bureau, National Hurricane Research Project Report, No. 50, Pt. 1:1-10, 1962. 13 figs., table, 4 refs., 2 eqs. (Technical Conference on Hurricanes, 2nd, June 17-30, 1961, Proceedings). DWB M15.2 U5845r.

...The Met. Group at Brookhaven National Lab. continuously recorded instantaneous 3-sec readings of wind velocity at 75, 150, and 300 ft above ground for 6 hr during the approach and passage of hurricane "Donna". The data were obtained from bivanes and aerovanes mounted on a 410-ft tower, and analyzed in four 1.5-hr sections corresponding to the major changes in storm intensity. These sections are referred to as "before passage", "peak wind", "eye", and "after passage". Spectral analyses of the wind speeds were prepared for each period, and the resultant spectra compared with those obtained during the 1954 Hurricanes "Edna" and "Carol". An analysis of precipitation data reveals that a consistent periodicity existed in 5-min rainfall intensities, and seems to be related to the distance of the hurricane center from the Lab. site. This paper also includes an investigation of the relationship between wind and rainfall, as a strong correlation was found between 5-min peak wind and 5-min peak rainfall.--Authors' abstract

182. Singer, Irving A. Wind gust spectra. NewYork Academy of Sciences, Annals, 116(1):116-135, June 26, 1964. 12 figs., table, 12 refs.

...Reviews some of the recent activities and studies of atmospheric turbulence at Brookhaven in an effort to correlate and summarize these results for practical application. The applicability and limitations of the data; some basic principles and semantics of the statistics of turbulence; and characteristics of the intensity of turbulence, power spectra, and correlation functions in the lowest 300 ft are discussed. Results applicable between 75 and 300 ft

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over smooth terrain are presented. It was found that intensity of turbulence is constant with height; local isotropy exists at wavelengths shorter than approximately 100 m; horizontal isotropy is continuous up to wave lengths of approximately 500 m; cross spectra are essentially zero in range of interest; cross correlation coefficient of similar wind components is a function of the ratio of heights.--M.G.A. 169-454

183. Smith, F. B. and Abbott, P. F. Statistics of lateral gustiness at 16 m above ground. Royal Meteorological Society, Quarterly Journal, 87(374):549-561, October 1961. eqs., 6 figs., 7 refs., 6 tables. DWB M(05) R8882 V. 87.

...The horizontal lateral wind-fluctuations at 16 metres above ground have been recorded over periods totaling 1,350 hours by a system described by Jones and Pasquill (1959). Hourly-average values θ_τ of the standard deviation of wind fluctuations sampled within times τ = 5,30, and 180 sec are classified according to windspeed and stability $s = \Delta T/U^2$ °F/(m/sec)^2 (where ΔT is the temperature difference between 7·1 m and 12 m, U is the wind speed at 15·5 m). A critical value of stability s = + 0·017 is indicated separating near neutral or unstable stabilities (s < 0·017), for which θ_τ depends primarily on stability, from very stable conditions (s> 0·017), for which wind speed is the dominant parameter. Some support for this transition also is found in the variation of spectrum shape with stability. A second transition on the unstable side may correspond to Priestley's critical value separating forced-and free-convection regimes. The results are in a form suitable for application to particle diffusion in the atmosphere. However, the large variations in wind direction in very stable conditions with light winds cannot be interpreted, at present, in terms of diffusion with the same degree of certainty as in near-neutral stabilities.--Authors' abstract

184. Stearns, Charles R. Micrometeorological installation on Lake Mendota. (In: Lettau, Heinz H. (ed.), Studies of the three-dimensional structure of the planetary boundary layer. Wisconsin. Univ. Dept. of Meteorology, Contract DA-36-039-SC-80282, Final Report, Oct. 1962. P. 7-45, 35 figs., 2 tables, 8 refs., 18 eqs.) DWB M(051) W811te Final

...As a basis and reference station for micrometeorological field experimentation, directed towards the detailed investigation of boundary layer structure in the atmosphere, the Dept. of Met. has installed a tower station on Lake Mendota. The tower is instrumented to record micrometeorological data on a continuous basis, and detailed micrometeorological profile data, including supplementary elements, for periods of field experimentation. The details of installation, instrumentation, and analog and digital automatic recording systems are presented.--Author's abstract

185. Swinbank, W. C. The exponential wind profile. Royal Meteorological Society, Quarterly Journal, 90(384):119-135, April 1964. eqs., 14 figs., 10 refs., 3 tables. DWB M(05) R888q V.90.

...From a definition and a hypothesis the form of the wind profile in the turbulent boundary layer when the air is thermally stratified is derived as

$$\frac{\partial u}{\partial z} = \frac{u_*}{kL}\left[1 - \exp\left(-\frac{z}{L}\right)\right]^{-1}$$

or, in integrated form,

$$u_2 - u_1 = \frac{u_*}{k} \ln\left[\frac{\exp\left(\frac{z_2}{L}\right) - 1}{\exp\left(\frac{z_1}{L}\right) - 1}\right]$$

in the usual notation. This solution is expected to be applicable in all stabilities and to all heights below which the shearing stress and the vertical heat flux remain constant. A critical examination of the experimental procedure necessary to test the validity of this, or of any, formulation for the steady-state wind profile leads to a specification which the observational site and the weather conditions should meet. The results of a series of experiments are presented and analyzed. These comprise measurements of wind speed and temperature at a number of levels up to 16 metres, supplemented by observations of net radiation, heat flux into the air and into the ground, and shearing stress. The analysis affords good verification of the form proposed for the wind profile. A variety of evidence is adduced to show that buoyancy modifies the transfer of heat more strongly than that of momentum, and that the discrimination increases with height above the surface.--Author's summary

186. Tarkanyi, Zsuzza A homalyossagi tenyezb vizsgalata. [Study of the turbidity factor.] Hungary. Orszagos Meteorologiai Intezet, Hivatalos Kiadvanyai, Vol. 25, 1962. P. 88-95. 9 figs., 5 refs., 11 eqs. German and Russian summaries p. 88. DWB M(055) H936p V. 25.

...In the introduction the physical characteristics of the turbidity factor are discussed and its values obtained from observations are given. The analysis is based on so-called old values of Linke's turbidity factor computed from data of direct radiation. The measurements were made during 1954-1961 in the Budapest-Loran Obs., with the Michelson-Martin actinometer, during 1957-61 in the Siofok Obs. and on the Kekes Summit (Matra Mts.) with a pyrheliometer of the Moll-Gorczynski type. The daily and annual march of the turbidity factor are determined. Then the relationship of the values of the turbidity factor to the macrosynoptic situation according to Petseli and also to air masses and wind directions, are investigated.--Translation of Author's summary

187. Taylor, R. J. Analysis of some wind profiles in the atmospheric friction layer. U. S. Air Force. Cambridge Research Labs., Research Report [Unnumbered], Aug. 1963. 17 p. Fig., 6 tables, 12 refs., 20 eqs. (AFCRL-63-861) DWB M54 T245 an.

...In the layer of atmosphere between the surface and a level where the wind is close to the geostrophic (the "friction layer"), the assumption is commonly made that the shearing stress and velocity gradient are parallel. Theoretical reasons are here advanced to indicate that this assumption is probably not valid and some analyses of observed wind pfofiles made on this assumption are shown to yield unrealistic results. Although the analyses are open to some criticism on the basis of instrumental inaccuracy and lack of horizontal uniformity of the observing site, the general conclusion is reached that parallelism of stress and velocity gradient cannot, in our present state of knowledge, be relied on.--Author's abstract

188. Texas. University. Electrical Engineering Research Laboratory Research directed toward the study and application of digital data processing methods to the problem of sensing and recording meteorological variables at various levels in an existing 1400 foot tower. Contract AF 19(604)-3498. Final report, April 1960, by W. S. Mitcham and J. R. Gerhardt. 12 p. 3 figs. DWB M(051) T355rep.

...Describes a meteorological research data-acquisition system utilizing a 1434-foot television tower at Cedar Hill, Texas. General information on the system's scope, operating features, and checking procedures is provided, and the data format and data editing procedures are discussed in some detail.--JAW

189. Thompson, N. Intensities and spectra of vertical wind fluctuations at heights between 100 and 500 ft in neutral and unstable conditions. Royal Meteorological Society, Quarterly Journal, 88(377):328-334, July 1962. 8 figs., 6 refs., table. DWB M(05) R888q V.88.

...Records of vertical gustiness have been obtained using a sensitive vane attached to the cable of a tethered balloon. Electrical filtering of the output signal from the vane reduced the labour of subsequent computation. Intensities of turbulence were found to decrease with increasing wind speed. Length scales generally showed no regular trend with height below 400 ft., because of (a) the dependence of scale on stability, and (b) the heterogeneity of the present data as regards stability. Most spectra exhibited two major peaks.--Author's abstract

190. Thornthwaite (C.W.) Associates, Laboratory of Climatology Measurement of vertical winds in typical terrain. Signal Corps Contract No. Da 36-039 SC-84940, DA Project No. 3A99-07-001-03. Report No. 1, October 1960, by C. W. Thornthwaite and W. J. Superior. 8p. 5 figs. Report No. 2, January 1961, by C. W. Thornthwaite and W. J. Superior. 6p. Report

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No. 3, April 1961, by C. W. Thornthwaite et al. 92 p. 2 append. tables, eqs., 32 figs., 23 refs., 11 tables. Report No. 4 (Final Report), July 1961, by C. W. Thornthwaite, W. J. Superior and J. R. Mather. 246p. 6 append. tables, 26 figs., 20 refs., 7 tables. DWB M(051) T513re Nos. 1-4.

...The report describes preliminary work on a study of the vertical winds over different typical terrains. The study is divided into three tasks: instrumentation, site selection, and data analysis. Work during the first quarter has involved manufacture, testing and calibrating of measuring instruments, assembly of instrument masts, and the drawing up of plans for a mobile instrument trailer. A number of observation sites were studied and certain sites having markedly different terrains have been selected for future use. The type of measurements to be made and instrument read-out techniques to be used will be based on an understanding of the type of data analysis which will prove most useful in the presentation of final results.--Authors' abstract - Report No. 1

...The report describes the work during the second quarter of a research contract to measure the vertical winds over different typical terrains. The principal emphasis has continued to be on the construction of the necessary vertical wind measuring instruments, and the instrument masts, and the design of the recording system. A preliminary set of field observations has shown that the instruments are working satisfactorily. In addition, the observations have shown a strong influence of topography and other local environmental factors on the strength and persistence of the vertical wind. These results have led to a further consideration of the problem of obtaining observations over different "typical" terrains.--Authors' abstract--Report No. 2

...The report describes the development of a sensitive anemometer to measure the vertical motion of the air and explains its use in determining the vertical winds over typical terrains. The report also explains the use of the vertical anemometer as part of a flux meter system to determine the eddy transport of momentum, sensible heat, and moisture near the earth's surface. The vertical anemometer sensor consists of a three-bladed windmill which will turn at a rate proportional to the magnitude of the vertical component of the wind and which responds equally to updrafts and downdrafts. The vertical anemometer will give time average values of the upward and downward vertical component of the wind, or with a simple modification, it will indicate and record the instantaneous values of the vertical components. Wiring diagrams, response curves, and detailed operating instructions are included. The vertical anemometer provides a new basis for determining the fluxes of momentum, heat, and water

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vapor. The combination of the vertical anemometer, to provide necessary switching and chart advance signals, with a suitable sensor to measure the element under investigation allows the direct measurement of the flux of the element without the need for complicated formulas or theories. The different observation sites in the vicinity of Centerton, New Jersey are described in detail and the results of preliminary observations of vertical winds, shearing stress and surface drag are presented. The values of these parameters are found to differ considerably with wind direction and speed and with the varied exposures in different parts of the observation sites. The momentum flux, or surface drag depend quite sensitively on the nature of the obstacles present, on small differences in slope and on the nature of the surrounding terrain. Kinetic energy dissipation is computed for sample periods. One series of vertical wind observations has been subjected to power spectrum analysis. The observations confirm that at all observation sites so far investigated the mean value of the vertical motion is not zero; the points exhibit mean upward or downward motion, which must balance out over an area.--Authors' abstract--Report No. 3

The same report also appears as: C. W. Thornthwaite Associates, Laboratory of Climatology. The measurement of vertical winds and momentum flux. Publications in Climatology, 14(1), 1961. 89p. < append. tables, 32 figs., eqs., refs. tables. DWB M8 T513p V.14, No. 1.

...This is the Final Report on a one-year research study conducted for the U. S. Army Signal Research and Development Laboratory on the measurement of vertical winds over typical terrain. The report describes a sensitive, three-bladed, windmill type vertical anemometer used to obtain vertical wind observations and discusses its operating characteristics. The new vertical anemometer has a starting speed of less than 10 cm sec^{-1}, responds in a linear fashion to the vertical component of the wind flow with angles of attack less than $\pm 45°$ and has a distance constant ranging from 2.9 to 5.0 feet as the angle of attack varies from 10 to 40 degrees. The new instrument system provides for the first time a means to obtain reliable observations of the vertical wind in sufficient number to give an understanding of its importance and geographical distribution. The relative ease in making the observations and the direct method of instrument exposure and readout make this system very useful in many applications. The vertical anemometer is an operational, field instrument which can be used by relatively inexperienced personnel to provide direct observations of the instantaneous or time and space averaged vertical velocities over almost any type of terrain conditions. The report includes the results of a number of observations of both vertical and horizontal wind which have been taken at different heights and at different locations in two experimental field sites in Centerton. The analyses which have been performed to date confirm our previous

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conclusion that the mean vertical motion ($\bar{w}$) is not zero at any particular site or during relatively short time periods although it will tend to zero over a large area and extended time period. The vertical wind velocity is found to be much smaller than the horizontal. Short bursts of vertical activity greater than 250 cm sec^{-1} have been measured but for more than 80 percent of the time the vertical velocities are found to fall between ± 50 cm sec^{-1}. Spectral analyses of 76 different 17 minute simultaneous records of vertical and horizontal velocities have been completed. The variance of the horizontal component of the wind is much greater than that of the vertical component. At high frequencies $u^2 sec^{-2}$ is two to ten times greater than $w^2 sec^{-2}$ while at low frequencies it is ten to one hundred times greater. Only rarely does there appear to be an equipartition of turbulent energy between the u and w components of the wind. The selection of observation sites depends on the use to which the observations are to be put. The land near Centerton while gently rolling and with a diverse cover of open fields, woods, lakes, and orchards is typical of a wide area of mid-latitudes. Thus, observations over such a terrain should provide basic information on the influence of a heterogeneous natural environment on vertical winds. A number of recommendations to the Signal Corps concerning the possible influence of vertical winds on the launching of missiles are included. The influence of vertical winds appears to be negligible most of the time. It would be possible to develop a reliable field system to check the magnitude of the vertical velocities at any time and to incorporate this knowledge into a tactical program of missile firings. The report includes several brief excerpts from a two-day symposium on vertical winds held at the Laboratory.--Authors' abstract--Report No. 4

The same report also appears as: Thornthwaite (C.W.) Associates. Laboratory of Climatology Vertical winds near the ground at Centerton, N. J. publications in Climatology, 14(2), 1961. 244p. eqs., 26 figs., 6 append. tables, 20 refs., 7 tables. DWB M8 T513p. V.14, No. 2

191. Thornthwaite, C. W.; Superior, W. J. and Mather, J. R. Vertical winds near the ground at Centerton, N. J. Thornthwaite, C. S., Associates. Lab. of Climatology, Centerton, N. J., Publications in Climatology, 14(2); 1961. 244 p. 26 figs., numerous tables, refs. Contract DA-36-039 SC-84940, Final Report. DWB M8 T513p.

...This is the final report on a one year study on the measurement of vertical winds over typical terrain. It describes a sensitive, three-bladed-, windmill type vertical anemometer used to obtain vertical wind observations and discusses its operating characteristics. Includes the results of a number of observations of both vertical and horizontal wind taken at different heights and at different locations in two experimental field sites in Centerton, N. J. Analyses to date confirm the previous conclusion that the mean vertical motion is not zero at

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any particular site or during relatively short time periods although it will tend to zero over a large area and extended time period. The vertical wind velocity is found to be much smaller than the horizontal. Short bursts of vertical activity >250 cm sec^{-1} have been measured but for more than 80% of the time the vertical velocities are found between ± 50 cm sec^{-1}. The variance of the horizontal component of the wind is much greater than that of the vertical component. A number of recommendations to the Signal Corps concerning the possible influence of vertical winds on the launching of missiles is included. The influence of vertical winds on the launching of missiles is included. The influence of vertical winds appears to be negligible most of the time. It would be possible to develop a reliable field system to check the magnitude of the vertical velocities at any time to incorporate this knowledge into a tactical program of missile firings. The report includes several brief excerpts from a two-day symposium on vertical winds held at the Laboratory.--M.G.A. 15.11-15

192. Thuillier, R. H. and Lappe, U. O. Wind and temperature profile characteristics from observations on a 1400 ft tower. American Meteorological Society, Journal of Applied Meteorology, 3(3):299-306, June 1964. eqs., 7 figs., 9 refs., table. DWB M(05) J86joa V.3, No. 3.

...Profiles of mean wind speed obtained from a 1420-ft tower are analyzed on the basis of similarity theory to determine the relationship of profile shape to lapse rate structure. A total of 274 profiles representing four observation times (0600, 1000, 1400, and 1800 CST) are used in the analysis. Thirty minute averages of the wind speed are taken at eleven levels on the tower at these observation times. The wind speed values are normalized by means of the friction velocity as well as a reference height velocity computed at the lowest observation level, and profiles for these wind speeds are grouped according to profile shape characteristics. For each group, an average profile is computed and the vertical variation of mean wind speed is compared to a logarithmic or power law profile form. Results of the study indicate that the mean wind profiles are dependent on the lapse rate structure and can be divided into "non-inversion" (lapse rate greater than isothermal) and "inversion" (lapse rate less than isothermal) profiles. For near adiabatic or slightly unstable lapse rates (midday non-inversion profiles), the logarithmic wind law represents the data well to a height of 300 to 400 ft. Above this height the wind speed is nearly constant. The more stable non-inversion wind profiles (lapse rates varying from about 2F to 5F per 1000 ft) generally show greater wind shears. These profiles are represented with a power law. The wind profiles associated with lapse rates containing inversions are highly variable and depend on the nature of the inversion present. There appears to be an inter-dependence of vertical shear and inversion lapse rates for these profiles.--Authors' abstract

193. Tourin, Myron H. and Hoidale, M. McLardie Low level turbulence characteristics at White Sands Missile Range. U. S. Army Signal Missile Support Gaency, Technical Report MM 431, April 1962. 129 p. 109 figs., 4 tables, 10 refs. DWB M51.2 U5811o.

...Three-bladed aerovane wind data, obtained at White Sands Missile Range, are used to determine local turbulence characteristics. Measurements of the standard deviation of wind direction, σ_A , classified by season, time of day, and height above ground are analyzed, and a relationship between σ_A and mean speed μ is shown. The vertical characteristics of σ_A are studied and discussed. Other turbulence characteristics, intensity of turbulence, and its vertical behavior are also analyzed and discussed.--Authors' abstract

194. U. S. Air Force. Cambridge Research Center, Geophysics Research Directorate, Atmospheric Circulations Laboratory Cedar Hill Meteorological Research Facility. Instrumentation for Geophysics and Astrophysics, No. 18, June 1961, by D. W. Stevens. 16p. 3 figs. DWB M08 U582i No. 18.

...A meteorological research data-acquisition system utilizing a 1434-ft television tower at Cedar Hill, Texas is described. General information on the system's scope, operating features, and checking procedures is provided, and the data format and data editing procedures are discussed in some detail.--Author's abstract

195. U. S. Army Electronics Research and Development Activity, Environmental Sciences Directorate, White Sands Missile Range, New Mexico A comparison to tower and pibal wind measurements. ERDA-304, April 1965, by Laurence J. Rider and Manuel Armendariz. 17 p. eqs., 6 figs., 21 refs. table. DWB M(055) U5812er ERDA-304.

...An empirical study of the time and space variability of the wind as measured by a tower-mounted wind instrument and triple-theodolite pilot-balloon observations at Green River, Utah, during the months of June and July 1964 is presented. Simultaneous wind measurements at 500 feet above the ground are compared. Mean difference in wind direction was 15.0 degrees with a sample standard deviation of 12.2 degrees. The mean speed difference was 6.2 ft/sec. with a sample standard deviation of 5.5 ft/sec.--Author's abstract

196. U. S. Army Electronic Research and Development Activity, Environmental Sciences Department, White Sands Missile Range, New Mexico Monthly wind and temperature distributions in the first 62 meters of the atmosphere for White Sands Missile Range, New Mexico. ERDA-113, February 1964, by Frank V. Hansen and Van Dyke Neill. 34p. eqs., 3 figs., 2 refs., 14 tables. DWB M(055) U5812er ERDA-113.

...Distribution of scalar winds and temperature by months (based on observations taken over a two-year period, April 14, 1958-April 29, 1960) are presented. The data have been analyzed and tabulated at

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eleven cumulative percentage frequency levels for nine tower observational levels (4.6, 11.9, 19.3, 26.6, 33.9, 41.2, 48.5, 55.8 and 62.0 meters) above the surface.--JAW

197. U. S. Army Electronics Research and Development Activity, Environmental Sciences Directorate, White Sands Missile Range, New Mexico Orographic effects on wind variability. ERDA-157, July 1964, by James D. Horn and Elmer J. Trawle. 20p. eqs., 12 figs., 10 refs., table. DWB M(055) U5812er ERDA-157.

...Information on wind variation as a function of speed and azimuth is presented for two observing tower sites. Charts of standard deviation of low-level wind speed and mean wind direction have been analyzed. A relation between these values and terrain features such as canyons and mountain barriers is suggested.--JAW

198. U. S. Army Electronics Research and Development Activity, Fort Huachuca, Arizona Vertical temperature gradients in the first 200 feet of the atmosphere of the Arizona desert. Meteorological Research Notes, No. 4, by J. F. Appleby and W. D. Ohmstede. Pub. No. ERDAA Met. 4-63, January 1963. 110p. eqs., 17 figs., 13 tables. DWB M(055) U5812 met No. 4.

..."Resluts of a program of observations and analysis of the vertical distribution of temperature in the atmosphere layer near the ground are reported. A discussion of the significance of the results as they pertain to the mechanisms of turbulent transfer is included." The observational program was conducted in southwestern Arizona in the northern extension of the Sonora Desert. The three towers are located in the vicinity of Gila Bend, Sentinel and Dateland, Arizona respectively. Tables present the following data: frequency distribution of vertical temperature gradient for the months of January thru April and August thru October; mean temperature by hours for the summer months at heights of 5, 25, 50, 96 and 206 feet; hourly mean temperature gradient for January-April and August-October; average hourly temperature changes for August-October; and temperature gradient versus wind speed for January-April and August-October. All data are for the year 1956.--JAW

199. U. S. Weather Bureau, Research Station, Las Vegas, Nevada Micro-meteorological measurements(U). Operation Roller Coaster. Project Officers Report-Project 2.4. R. W. Titus, Project Officer. July 1965. 87p. figs., refs., tables. Filed in Foreign Section, Office of Climatology.

...Documentation of meteorological parameters occurring just prior to, during, and for a period after each of the four events of the series was the primary object of Project 2.4 (Micro-meteorological measurements). The meteorological parameters desired were wind speeds and directions form the surface to 3,000 feet above it, temperature profile in the same layer, and turulence measurements. The wind data and temperature data

were required to be continuously monitored at the control point during each event. This required various types of telemetering and communications. Surface wind data were collected using sensors on 30-foot towers at locations in the downwind array. M-33 radars sited along the border of each array, with remote release points down the array centerlines, were used to obtain event winds-aloft profiles. Two 120-foot United Kingdom (UK) towers near each GZ (ground zero) supplied additional wind data at the 60-foot and 120-foot levels plus gustmeter data for turbulence evaluation. Pibal crews obtained gross scale wind features for use by event weather briefers. A tethered United Kingdom balloon with sensors at 100-foot intervals obtained vertical temperature profiles. Also at each event shot time, United States Weather Bureau (USWB) personnel obtained a temperature sounding using modified rawinsonde equipment.--Author's abstract

200. U. S. Weather Bureau A preliminary analysis of some observations of wind shear in the lowest 100 feet of the atmosphere for application to the problem of the control of aircraft on approach. by Charles F. Roberts. September 1964. eqs., 5 figs., 3 refs., 2 tables. DWB M54 U587p.

...Investigation of wind shear characteristics in the last few hundred feet of aircraft approach zone. Discusses: the observational program; wind profile analysis and wind shear arising from short period gustiness. Four tower sites in the vicinity of Washington, D. C. were instrumented to provide a picture of the variation of wind profile structure over a wide area. Tables present the following data: average and maximum wind shear values for various lapse rate (-1.5 to 3.0°F) and surface (Damascus only) and 100 foot wind speed classes(1.0-12.0 knots). Tower sites are Damascus, Maryland, Waldorf, Maryland, Silver Hill, Maryland and Tysons Corner, Virginia.--JAW

201. World Meteorological Organization Sites for wind-power installations, Technical Note, No. 63. WMO-No. 156. TP.76. Geneva, Switzerland, 1964. 38p. eqs., 28 figs., refs., tables. DWB M(06) W927p No. 156.

...For relatively uniform flat ground of defined roughness, it is shown that the logarithmic law is roughly valid up to at least 100 m above ground for adiabatic and slightly unstable conditions. The importance of ground roughness in selecting a wind-power site is emphasized. The vertical wind shear increases markedly with onset of stable thermal stratification and for climates where these conditions occur often, increments in height of a wind generator may often yield significant power additions. The height characteristics of diurnal wind circulations (sea breeze and valley wind) is discussed in some detail. Favourable topographic-synoptic wind confirgurations are suggested. Characteristics of flow over hills and mountain ridges are discussed in detail. Available information on the vertical profiles of wind speed and gustiness over hill summits is summarized. Some observations are produced which show the existence of speed-up factors on hill and mountain summits, but it is pointed out that such speed-up factors occur under relatively

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specialized synoptic conditions. The effect of air-mass stability, local insolation (upwind or downwind side) on speed-up factors is discussed in some detail.--Author's abstract

202. Wörner, H. (Meteorologisches Hauptobservatorium Potsdam) Aussergewöhnliche Trübung der Atmosphäre am 3. und 4. August 1962. [Extraordinary atmospheric turbidity on Aug. 3 and 4, 1962.] Zeitschrift für Meteorologie, Berlin, 16(9/10):265-268, 1963. 2 figs., table. 5 refs. DWB M(05) Z48 V.16.

...The tabulated and plotted values of the turbidity factor obtained at Potsdam, Dresden, Gotha, Fichtelberg and Heiligendamm show that the abnormal turbidity obviously covered an area extending 300 km noth and south and 100 km east and west. The changes in the Angström B and A turbidity parameters from July 31, to Aug. 4, 1962 are shown graphically. Industrial smoke and the large forest fires in France during the preceding week could not, in the author's opinion, have been the sources of this abnormal turbidity. The cause thus remains unknown.--D.B.K.

203. Yamamoto, Giichi and Shingnuki, Atsushi Profiles of wind and temperature in the lowest 250 meters in Japan. Sandai, Japan (Miuagi Prefecture). Tohoku University. Science Reports, 5th Series, Geophysics, 15(3):111-114, 1964. 4p. fig., 5 refs., table. DWB P Collection.

...Wind and temperature profiles up to 253 m observed at the Tokyo Tower are analyzed. The profile due to the similarity theory explains the observed results up to about 200 m height above the ground. It is noted that the friction velocity u_* as well as the roughness parameter z_o are large in the large city. It is concluded that the thickness of the layer of constant shearing stress is greater over the rough surface than over the smooth surface.--Authors' abstract

204. Yeh, Tu-cheng and Li, Mei-tsun Adaptation between the wind and the pressure field in the meso- and small-scale motions. Scientia Sinica, Peking, 14(3):437-450, March 1965. Figs., refs., eqs. DLC

...The quasi-geostrophic motion is a very important characteristic of the large scale motion in middle and high latitudes. The geostrophic relation has been used widely in synoptic analysis, forecasting, and numerical predictions. Recently, the observations and analysis of data of meso- and small-scale motions have progressed rapidly. The following question arises naturally. Is there any quasi-balanced state in the meso- and small-scale motions just as the geostrophic wind in the large scale motion? If some quasi-balanced relation between the wind and pressure field exists, what is the form then? In the large scale motion in the middle and high latitudes there are 2 essential processes, namely, the adaptation process and the evolution process. Do the same hold in the meso- and small-scale motion? If so, what are the physical characteristics of the 2 processes? These are the problems dealt with in this paper.--Authors' abstract

LATE ABSTRACTS

205. Bhalotra, Y. P. R. Wind energy for windmills in Sudan. Sudan. Meteorological Service, Memoir No. 7, March 1964. 22p. Figs., tables, refs. DWB M(055) S943me No. 7.

...Wind data of 13 stations in Sudan, equipped with Dines anemographs, have been analyzed from the point of view of wind power utilization. Rough isovent maps for the periods, Dec.-March, April-June, July-Sept., Oct.-Nov., and for the year as a whole, have been drawn. Based on the values of the mean hourly wind speeds at the 13 stations, the speed frequency curves for the representative months of Jan., April, July and Oct., and for the year, have been given for these stations. The annual speed-duration curves, giving the number of hours in the whole year when speeds exceeding different values are recorded, are also shown. At each station, the energy available from the prevailing winds, by the use of a windmill of given specifications, has been calculated for each month of the year, and the quantities of water that can be lifted daily at the various stations have been worked out. The monthly output of electrical energy that can be generated has also been tabulated for 9 selected stations. It appears that, broadly speaking, the area of Sudan North of lat. 12°N and between long. 28°F and 35°F, and the coastal strip along the Red Sea, may be considered for the installation of windmills at favorable sites. During the dry period Dec.-March, however, sufficient wind energy is available in the Nile Valley as far south as Malakal.--Author's abstract

206. Brundidge, Kenneth C. Wind and temperature structure of nocturnal cold fronts in the first 1420 feet. Monthly Weather Review, Wash., D. C., 93(10):587-603, Oct. 1965. Figs., tables, refs., eqs. DWB M(05) U597m V.93, No. 10.

...Results are presented of determinations of the temperature structure and relative streamlines for 11 cold fronts as obtained from data collected on the 1420 ft TV transmitting tower at Cedar Hill, Tex. The temperature patterns were found to approximate the textbook case only when the frontal zones were strongly baroclinic and some instances of extreme overrunning were found when a pre-frontal nocturnal inversion existed. The relative flow patterns generally show a confluence of warm and cold air within the frontal zone, implying that the front cannot be treated as a substantial surface. Vertical turbulent mixing appears to be an important factor in the maintenance of the temperature structure.--Author's abstract

207. Plate, E. J. and Quraishi, A. A. Modeling of velocity distributions inside and above tall crops. Journal of Applied Meteorology, Boston, 4(3):400-408, June 1965. Figs., tables, refs., eqs. DWB M(05) J86joa V.4, No. 3.

...Velocity distributions inside and above a model crop were investigated. The model crop consisted of flexible plastic strips fastened to the floor of a low speed wind tunnel. The experimental results

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indicated that at some distance x_o downstream from the edge of the roughness cover the velocity profiles were similar inside and also above the cover. The length x_o is discussed. The experimental results for the velocity distribution inside the plant cover were compared with field data obtained from different sources. A presentation of the velocity profiles inside the canopy in non-dimensional form collapsed all field and laboratory data for a given crop type on one curve. The laboratory flow above the crop cover was analyzed using a power law form and using the logarithmic velocity distribution law. On the basis of the experimental results it is recommended that a 2-tower arrangement of wind velocity measuring devices be used both for the evaluation of the surface shear stress and for checking the establishment of similarity profiles in the field.--Authors' abstract

208. Swanson, R. N. and Cramer, H. E. Study of lateral and longitudinal intensities of turbulence. Journal of Applied Meteorology, Boston, 4(3):409-417, June 1965. Figs., tables, refs. DWB M(05) J86joa V.4, No. 3.

...An analysis of the lateral and longitudinal intensities of turbulence measured on a 62-m meteorological tower over a 2-yr period at White Sands Missile Range shows that both intensities decrease with height in all thermal stratifications. This decrease can be expressed in terms of a simple power law in which the value of the exponent on height varies from about--0.1 to --0.3 as the stratification changes from lapse to inversion. Also, the turbulent intensities at all heights and in all thermal stratifications tend to be inversely proportional to the mean wind speed. This relationship is most pronounced during lapse conditions when the product of mean wind speed and turbulent intensity is practically constant. Diurnal variations of the intensities at 5 heights are presented for 3 wind speed regimes, and the results are compared with measurements made previously at other locations.--Authors' abstract

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